Vol. 107 No. 2676 THURSDAY Sept 4 1952 9d.

THE MODEL ENGINEER

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

4TH SEPTEMBER 1952 VOL. 107 NO. 2676

Smoke Rings 301
The Sheffield Exhibition, 1952 303
An Automatic Cross-feed for the Lathe 306
Model Power Boat News—The Hispano-Suiza and Ford Trophy Races .. 307
A Small Brazing Hearth 310
The Allchin " M.E." Traction Engine to 1½-in. Scale 311
"L.B.S.C.'s" Lobby Chat—Mr. Buckle's " Britannia " 315
Making a Workshop Camera 319
Horseley Bridge 322
The Mechanics of Radio Control .. 323
Some Motor-car Repairs 326
Practical Letters 330
Club Announcements 331
Diary of Coming Events 331

SMOKE RINGS

Our Cover Picture

● THE FIRST all-British gas-turbine-electric locomotive, designed and built by Metropolitan-Vickers in 1951, has been at work on British Railways, Western Region, since last February. Before this locomotive, which is numbered 18100, was put into regular service, it was subjected to a series of rigorous tests and proved itself thoroughly capable of fulfilling all the specified requirements as regards power, tractive effort and good riding at high speed. The trials included a series of runs with a 17-coach train at speeds up to 85 m.p.h., and a number of trips with twelve and eighteen coaches up the Hemerden bank near Plymouth. On at least two occasions, No. 18100, hauling eighteen coaches (650 tons total) was stopped halfway up the 1½ miles of 1 in 42 grade, but had no difficulty in re-starting. With 60,000 lb. tractive effort and 130 tons adhesive weight available, we ought not, perhaps, to be surprised at such performances.

Our photograph was taken on a recent Saturday and shows No. 18100 at speed near Twyford, Berks, hauling the 7.45 a.m. Bristol to Paddington express. The same day, the engine worked the 11.15 a.m. Paddington to Bristol express and returned with the 2.57 fast train from Bristol.

It would probably not be possible to work these three turns in one day with one steam locomotive, so short is the turn-round time at each end. No. 18100 and the Swiss-built example, No. 18000 are demonstrating the possibilities of their kind, which are certain to attract much attention overseas.

" M.E." Exhibition Posters

● COPIES OF the poster advertising the 1952 " M.E." Exhibition will be available on and after Monday, September 8th. Readers, traders and others desiring to display these posters for our mutual interest are advised to make early application to the Exhibition Manager, 23, Great Queen Street, London, W.C.2.

Brazing Demonstrations at the " M.E." Exhibition

● ONE OF the features of the " M.E." Exhibition which has proved so popular in the past is the series of stands where various workshop processes, etc., are actually demonstrated. This year, the Constructional Demonstration Area is being planned as in the past and should be as attractive as ever.

Kennion Bros. (Hertford) Ltd., will be putting in some time in this section, and Mr. C. Kennion invites model engineers to bring along small jobs to be brazed or silver-soldered. In return for a small payment, to cover the cost of materials used, Mr. Kennion will, himself, do the actual brazing, silver-soldering, etc. As he is an expert at this kind of work, his methods will be instructive and interesting, while there will, of course, be no doubt that the job is done in the best possible manner. So, if any reader wants any small job of this sort done, here will be an opportunity that should not be missed.

Motor-car Repairs

● THE ARTICLE on this subject which appears in this issue (and may be followed by others) will possibly cause a few of our readers to reiterate the old question "Is this model engineering?" We will anticipate this criticism by emphasising that we have no intention of encroaching on the class of subject normally dealt with by journals devoted to motor cars or automobile engineering, but to treat this work purely and solely from the aspect of applying the resources of the home workshop to work which might otherwise never be done at all. How many cars are laid up, or even relegated to the scrap heap, for the want of simple repairs or spare parts which are outside the normal capacity of the professional motor engineer, or considered to be an uneconomical proposition to undertake? Many of these jobs can be carried out quite effectively with the usual model equipment and provide both an interesting and useful exercise in mechanical work, enabling the workshop to help "earn its keep." There is always something fascinating in solving problems which arise in the wear and tear of running machinery, and a great satisfaction when the desired end is achieved. The garage fitter need never fear that model engineers will take away his living; on the other hand, they are more likely to do him a good turn by relieving him of many worrying and not very profitable jobs (from his point of view), without in any way intruding upon the normal routine of overhauls and major repairs which constitute his everyday work.

Railway Photographic Exhibition

● BY KIND permission of the Railway Executive, the exhibition organised by the Railway Correspondence and Travel Society, in association with the Railway Photographic Society, will be held at the Railway Executive Headquarters, 222, Marylebone Road, London, N.W.1, from October 6th to 11th next. It will be open daily to the public between the hours of 11 a.m. and 8 p.m., and admission will be free.

A catalogue is being prepared and will be on sale at the exhibition, price 1s., or alternatively, from the R.C.T.S. Hon. Publications Officer, 18, Holland Avenue, Cheam, Surrey, price 1s. 3d., post free.

Marlow Exhibition

● THE RECENT exhibition organised by the Marlow Society of Model Engineers proved to be a successful and homely event at which the quality of the exhibits was better than it was last year. A pleasing variety of models was to be seen while, in the park across the road, a length of 9½-in. gauge track had been laid for the purpose of providing rides for the youngsters.

Collaboration by societies at Oxford, Staines and Reading helped to swell the number of exhibits as well as to ensure some keen contests in the competition section; the Staines society won the club contest, the number, variety and collective quality of their entries scoring the highest marks.

We learn that, if the Marlow society decides to hold an exhibition next year, a rather novel prize is to be offered. It will be a cup to be awarded to the best model of any type of machine dating from before 1850. This may surprise those many people who, today, are inclined to think that it is only *since* 1850 that most worthwhile machines have come into use; but we venture to think that a little research, and even a little thought, would reveal that there was a fairly wide variety of machines and mechanical devices applied strictly to utilitarian purposes for a very long time before 1850. We feel that the Marlow society's idea may easily lead to some interesting results.

The *ex*-L.M.S.R. Turbomotive

● WE LEARN that British Railways locomotive No. 46202 is back in service after being converted from a 4-6-2 steam turbine to an ordinary four-cylinder reciprocating 4-6-2 engine of the "Princess" class. It has been named *Princess Anne*, in line with other engines of the class named after Royal Princesses; these are the well-known *Princess Royal*, *Princess Elizabeth* and *Princess Margaret Rose*.

As a turbine engine, No. 46202 had no name; it was purely an experimental machine built to investigate the possibilities of a locomotive propelled by a steam turbine instead of the orthodox reciprocating machinery. It was an interesting engine, and has given good service since it was built in 1935. It has not shown any marked overall superiority over the comparable standard type, although its riding qualities were exceedingly good. However, its maintenance has been an expensive matter, and when, last year, a heavy overhaul became due, the opportunity was taken to make the comparatively easy alteration into an ordinary steam locomotive of the popular "Princess" class.

Princess Anne has been put into main-line express passenger service between Euston and the North.

Ealing Arts and Crafts Exhibition

● WE HAVE received a preliminary notice to the effect that the Ealing Corporation propose to hold an Arts and Crafts Exhibition in the Town Hall, Ealing, W.5, from April 18th till the 26th, 1953. The exhibition is intended to display examples of arts and crafts produced by residents of Ealing, and there will be a "model engineering" section subdivided into: (i) Working models and mechanical toys; (ii) model aircraft, and (iii) model yachts and ships.

Final details have not yet been decided, but it is proposed that a prize of £5-0-0 be offered to the most popular working model to be judged by public ballot, and also that diplomas and certificates of merit be awarded.

We shall probably be publishing further news of this proposal, from time to time; meanwhile, the arrangements are in the hands of the Entertainments Manager, Mr. G. M. Kennan, Town Clerk's Department, Town Hall, Ealing, W.5.

A Change of Secretary

● WE HAVE been advised that there has been a change in the secretaryship of the Hastings and District Model Engineers Society. The new secretary is Mr. G. Priestley, "Morton," Boscobel Road, St. Leonards-on-Sea, to whom all future communications should be sent. We wish him all success in his appointment.

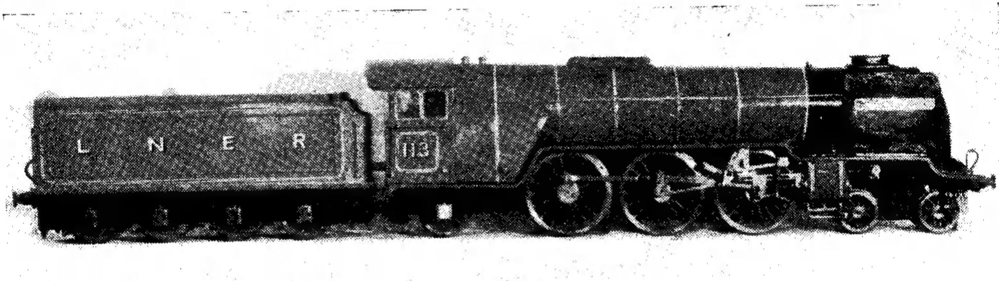
The Sheffield Exhibition, 1952

by "Northerner"

THE 1952 exhibition of the Sheffield and District S.M.E.E., as on former occasions, was replete with examples of good craftsmanship, and many favourable comments were forthcoming from members of the public.

The imposing 2¼-in. scale working model three-abreast gallopers, built by H. Slack, of Chapel-en-le-Frith, was seen working under steam throughout the exhibition, and its brilliance and accuracy were greatly appreciated by the visitors. However, since I described and illustrated this model extensively in a recent issue, we will merely remark that at Sheffield it inevitably won the Championship Cup, and First Prize in its class, and pass on!

Another exhibit was Mr. S. E. Watson's ½-in. scale 2-8-8-8-2 Compound Mallet articulated locomotive, scaled from the prototype built for the Erie Railroad of U.S.A. This imposing model was accompanied by a tiny model of its "driver"—or should we say "engineer," in American parlance?—a touch which helped the unitiated to realise the vast size of the prototype.



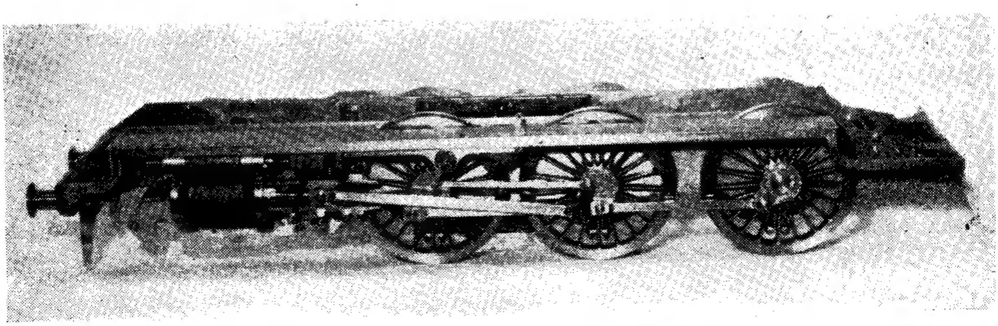
An excellent locomotive built to "L.B.S.C.'s" "Hielan' Lassie" design by F. Barker, of Nottingham

Locomotives

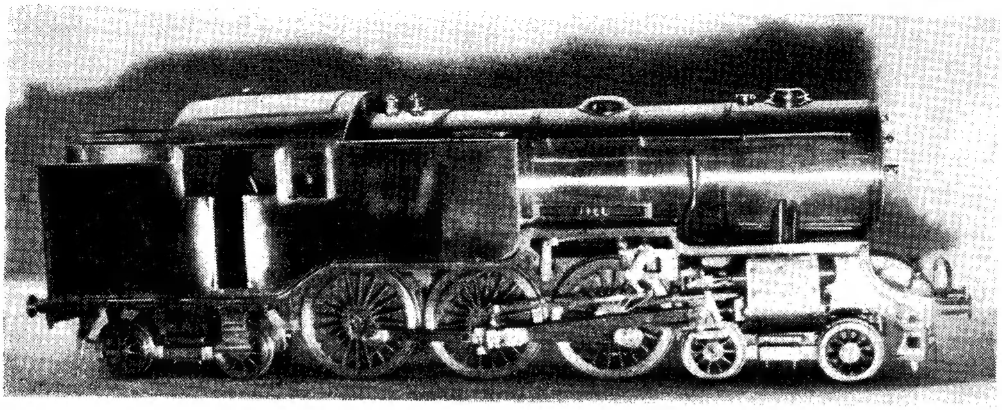
In the locomotive section, F. Barker, of Nottingham, was awarded First Prize, for his excellent 3½-in. gauge Pacific, which was built to "L.B.S.C's" instructions for *Hielan' Lassie.* Well-finished and nicely fitted, the locomotive should be a good performer on the track, unless its belies its appearance.

One of the most detailed models in the exhibition, though as yet far from complete, was the ¾-in. scale "Royal Scot" chassis by W. H. Wilson, of Sheffield. Unfortunately, the detail cannot show in the illustration, since it is so tiny, but it includes 7-B.A. castellated nuts, with genuine split pins, on parts of the motion, and lubricators (fitted with spring pins) only 5/32 in. across the flats of the hexagon. Mr. Wilson, who is in his seventies, showed me a complete set of miniature spanners which he made especially to avoid bruising the corners of the nuts—and incidentally, all the nuts of various sizes are home-made.

Piston-valves are fitted, with *six* rings on each bobbin. Another example of Mr. Wilson's



The "Royal Scot" chassis being built by W. H. Wilson, who also exhibited the well-finished patterns and coreboxes from which his castings were made



A 2½-in. gauge "Baltic Tank" built by W. Grange. The turning was done on a hand-driven lathe

thoroughness is that all the rods are fluted on *both* sides, even though the inside flutes will never be seen.

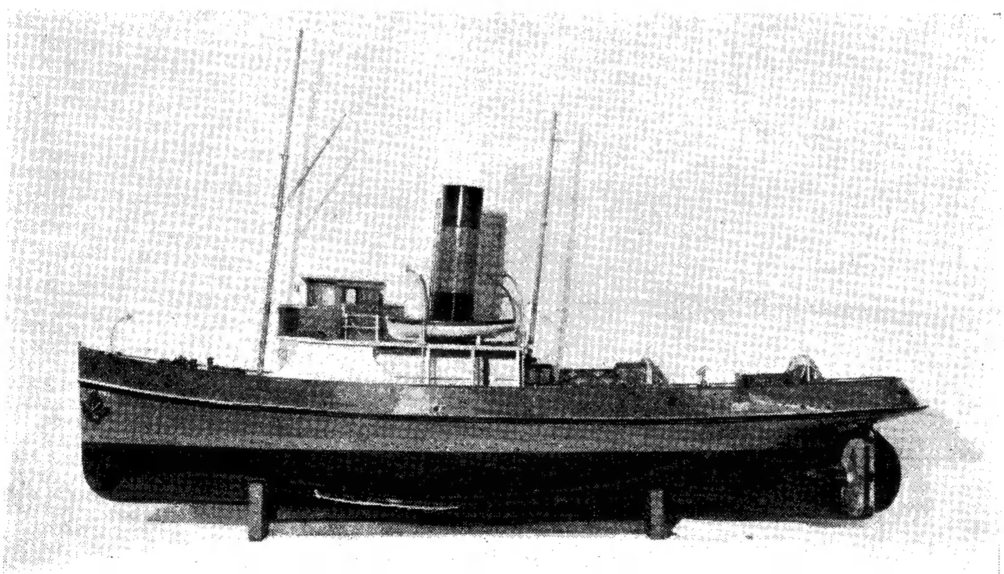
Another 2½-in. gauge locomotive on view was the 2½-in. gauge "Baltic" tank built by W. Grange a few years ago, when he had only a lathe which had to be turned *by hand*—not even a treadle! Well-finished and fitted, this engine may well serve as an example of perseverance and grit, to other members of the fraternity who are easily discouraged, although their workshops are better endowed!

Power-Boats

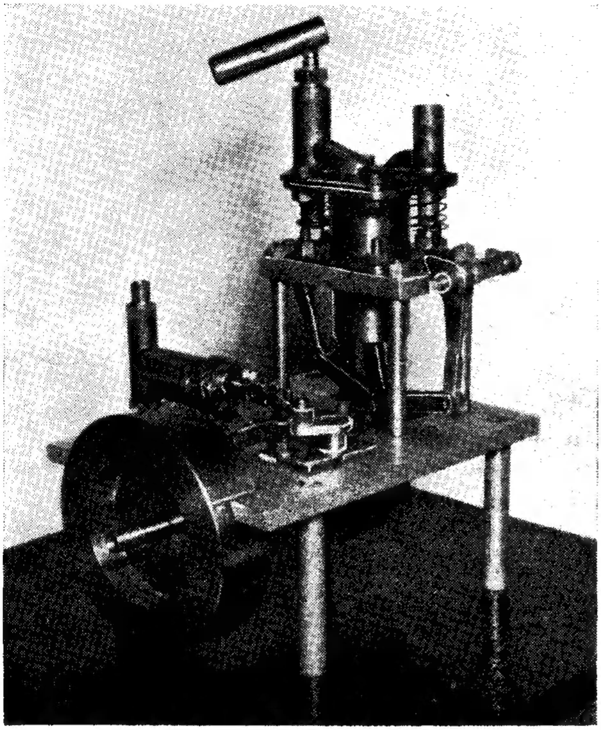
In the power-boat section, winner of the First Prize was the ½-in. scale radio-controlled life-boat *Elizabeth Rippon* by E. N. Bays, of Richmond, Surrey. Unfortunately, I cannot illustrate this model, but readers may remember it in last year's *Model Engineer* Exhibition. It certainly was a well-detailed and nicely-finished model.

P. Thompson's ½-in. scale steam tug was not entered in the competition class. Although the model itself is incomplete, the detail work is superb and the finish likewise. The engineroom will be just as interesting as the deck-fittings, incidentally, for it will contain a compound engine whose workmanship matches the rest of the boat. I look forward to seeing the finished vessel in due course, and hope that Mr. Thompson can be persuaded to send it to the London exhibition next year, if it is not ready for 1952.

Another model which was to ½-in. scale was of the paddle-steamer *Royal Eagle*, built by L. Leach, of the Sheffield Ship Models Society, and again the detail and finish were good, though not



A steam tug-boat, built to ½-in. scale by P. Thompson from a design published in THE MODEL ENGINEER



An experimental model steam-engine with an unusual poppet valve-gear, built by R. Howe

quite in the same category as the tug, perhaps. This model was not complete, but I believe that diagonal steam-engines are to be fitted, in which case the interior will be as worthy of inspection as the exterior, like the tug.

An Unusual Steam-engine

R. Howe, of Dronfield, had several steam-engines in the exhibition, mostly of more or less orthodox design, but his experimental single-cylinder single-acting engine possessed an unusual type of valve-gear. Both inlet and exhaust valves are of the spring-loaded poppet-type, and are opened by cams mounted on shafts on each side of the cylinder.

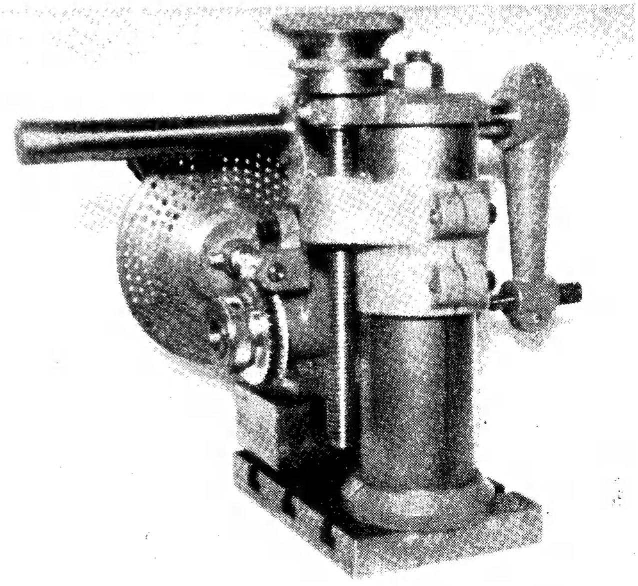
A lever integral with each cam is connected by links to a pin fitted approximately at the centre of the connecting-rod, so that the motion of the latter gives motion to the cam. The cam and rocking-lever are mounted eccentrically on the shaft, so that if the latter is rotated, and locked in the new position, the lift and timing of the valve are altered. Thus adjustment of the admission, cut-off, and exhaust relative to the stroke is possible.

A Universal Dividing Head

A " Universal dividing-head plus," built to the design of A. R. Turpin as published in THE MODEL ENGINEER, was awarded First Prize in the workshop tools section. It was built by F. J. Haynes, of Manchester, and was well-finished and fitted, bearing out the promise shown by Mr. Haynes' first model, the Massey steam-hammer which I recently described in these pages.

A Miniature Violin

An out-of-the-ordinary model was shown by F. Simpson, of the home club, in a miniature violin. Mr. Simpson has shown tiny violins before, but this one, which was 3⅝-in. long, was mounted in an electric light bulb. It was complete in every detail, including the bow, and Mr. Simpson is to be congratulated not only on finding an original subject for the exercise of his craftsmanship but, also on the quality of the craftsmanship itself.



The well-made " universal dividing-head plus " by F. J. Haynes, of Manchester, built to A. R. Turpin's design

An Automatic Cross-Feed

for the Lathe

by G. C. H. Fincham (South Africa)

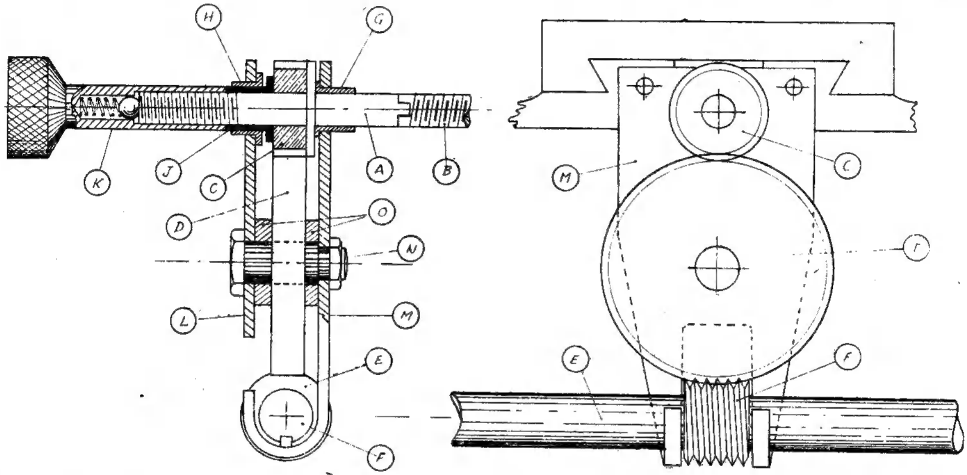
THE provision of some sort of automatic cross-feed on a lathe both enhances the utility of the machine, and relieves the operator of some often tedious knob twiddling, leaving him free to get on with some other work while a big facing job is under way. Apart from the mere convenience of one automatic cross-feed, I find that one can obtain a much better finish with the steady automatic feed than one can achieve with a somewhat jerky hand feed. An automatic cross-feed is usually provided on the more expensive lathes, but in my experience is seldom encountered in the more moderately priced machines.

The device to be described can only be fitted to certain types of lathes, where the cross-feed is constrained longitudinally, and is in fact a left-hand threaded leadscrew, and not a right-hand threaded one, which moves with the cross-slide. I fitted a similar mechanism to my "Logan" lathe, and find it invaluable.

The device is powered by a slotted shaft at the back of the lathe, and drives the end of the crossfeed screw remote from the handle. This shaft is belt-driven from the first wheel in the screwcutting train (which in my case revolves at mandrel speed) so that use may be made of the tumbler reverse gears. Three-step cone pulleys are used, grooved for the smallest size V-belt ("O" series) giving a maximum cross-feed of 6.2 thou. per rev. which is about right for the coarsest feed. This involves running the backshaft at about $\frac{3}{4}$ mandrel speed.

Perusal of the drawings should make the operation and construction of the device quite clear. No dimensions are given, as these necessarily depend on the peculiarities of the particular machine for which the device is intended.

The framework is composed of two $\frac{1}{8}$-in. steel plates, *L* and *M*, bolted, with suitable spacers, to the end of the cross-slide ways on the saddle. A tongued clutch shaft *A*, fitting into a slot in the feedscrew *B*, passes through a 16-tooth



gearwheel *C*, and runs in bronze bushes *G* and *H*, pressed into the steel plates. This shaft has a collar on it, and is threaded at the outboard end. A knurled control wheel *K* screws on to the shaft, and by means of a spacer *J*, pinches the gear-wheel against the collar on the shaft, forming a very elementary but fairly powerful single plate clutch. The gear *C* is driven by a short worm *E* through the idler gear *D*, which runs on a shouldered pin *N*, and is kept centralised by two loose sleeves *O*. Notice that one of the supporting plates, *M*, is extended downwards in the form of two horns, which are bent round so as just to clear the shaft. Their purpose is two-fold—to give the worm something to thrust against, and to move the worm with the saddle.

Points to watch are that the gearwheel *C* is of small diameter, as the boring table has to pass over it without interference, and that the control knob *K* has a trunk of sufficient length to make it accessible, even when the cross-slide is hard over. I found it advisable to fit a small spring and ball in the control knob, as shown, as there was a tendency for the knob to unscrew itself when the device was not in use and there was no axial load on the threads.

(*Continued on page* 309)

Model Power Boat News

by "Meridian"

The Hispano-Suiza and Ford Trophy Races

THE Hispano-Suiza and Ford Cups were both won in Geneva last year by Mr. G. Stone with his boat *Lady Babs II*, so that this year the venue for these races was over here, in England.

With the co-operation of the St. Albans and District S.M.E., a two-day regatta was held at the Lake, Verulamium, on a recent week-end. The Hispano race for 10 c.c. boats was run on the Saturday, and the Ford race for all classes on the Sunday.

It was disappointing that for the Hispano-Suiza race there were no Continental competitors. Much of the excellent arrangements at St. Albans had been organised with the attendance of the Swiss and French competitors in mind. M. Gems Suzor, however, had come over with his new 30 c.c. boat *Nickie IX* to run in the Ford race, so at least one event was a true "international."

Mr. T. Dalziel starting "Naiad II" ("B" class)

The regatta was officially opened by Sir Robert Bird, who was accompanied by Lady Bird, and in a humorous speech all competitors were wished the best of luck. Sir Robert is a great power boat enthusiast himself, and has plenty of experience concerning the vagaries of model i.c. engines.

Conditions for the 10 c.c. hydroplanes were really ideal, and high speeds were attained by many boats. As there was plenty of time available, it was decided in advance to allow all competitors three attempts, and this feature must have helped competitors to find the best adjustments, for the highest speed was returned on the third attempt by the winner, Mr. W. Everitt (Victoria), with *Nan*. The speed attained was 70 m.p.h. exactly, and this is the first time that this speed has been recorded actually in competition in this country.

Mr. G. Stone could not get *Lady Babs II* to run at all well, and subsequently the engine crankcase was found to be fractured; but his other boat, *Lady Cynthia*, made three runs, the best of which was 63.9 m.p.h., and this qualified for a place.

Mr. S. Poyser (Victoria), with *Rumpus* 3, made his best show to date, with a fine run of 64.3 m.p.h., and at the end of the second "round" this was the highest recorded speed. It was not until almost the end that it was exceeded, thus putting *Rumpus* 3 into second place.

Sixty miles per hours was also exceeded by three other boats; W. Everitt's other boat *Bill*, R. Phillip's *Foz* 2, and B. Miles' *Dragonfly* 3.

Mr. Phillips qualified for the best "All-British" speed, and won the special prize; it is good to see this boat on form again. The following list shows the speeds and placings of the leading boats. The letters "C." and "C. Res." indicate the M.P.B.A. classification of each boat :—

(1) W. Everitt (Victoria), *Nan* (C. Res.): 70 m.p.h.

(2) S. Poyser (Victoria), *Rumpus* 3 (C. Res.): 64.3 m.p.h.

(3) G. Stone (Kingsmere), *Lady Cynthia* (C. Res.): 63.9 m.p.h.

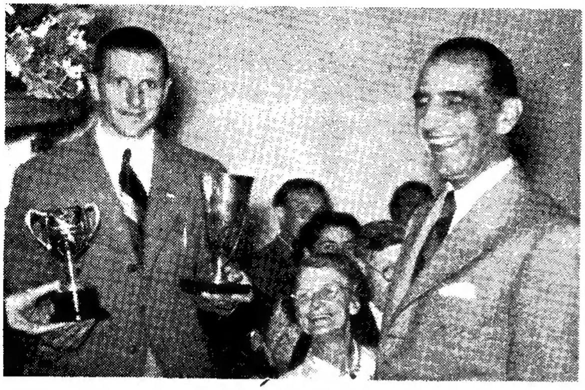
(4) W. Everitt (Victoria), *Bill* (C. Res.); 62.7 m.p.h.

R. Phillips (S. London), *Foz* 2 (C.): 61.2 m.p.h. All-British prize.

B. Miles (Kingsmere), *Dragonfly* 3 (C.): 60.8 m.p.h.

L. Pinder (Kingsmere), *Rednip* 7 (C. Res.): 55.0 m.p.h.

A dinner for competitors, members and friends was held the same evening at Batchwood Hall, St. Albans, and in the absence of Mr. E. T. Westbury, who was unable to be present, Mr.



Mr. W. Everitt (left) after receiving the Ford and Hispano-Suiza cups from M. Suzor (right)

J. B. Skingley took the chair. Unfortunately, Sir Robert and Lady Bird were not able to stay for the dinner, but a large number of people well known in model power boat circles were present, with friends and relatives.

M. Gems Suzor made a short speech in his very good English and presented the various cups to the winners. These cups were donated by B.M.A.R.C. Ltd., and were very fine trophies indeed. This social event provided a very pleasant interlude in the regatta, which was to be continued the following day.

The Ford Mechanics' Cup is a trophy contested by all classes of hydroplanes, and as the Sunday produced poorer weather conditions, it was expected that the Class "A" boats would have the advantage. In actual fact, speeds were generally lower than the previous day, but if E. Clark's *Gordon* 2 had managed to stay on top of the water, it must surely have won.

Due to the heavy entry only the usual two attempts could be allowed for each boat and at the end of the first run, two boats, G. Lines's *Sparky* 2 and W. Everitt's *Nan* were tying with exactly the same speed—60.1 m.p.h. ! As no one bettered this speed throughout the rest of the race, the tie had to be run off and this resulted in *Nan* recording 62.3 m.p.h. while *Sparky* 2 failed to return a time.

R. Phillips, with *Foz* 2, came third with a speed of 59.4 m.p.h. and S. H. Clifford fourth with *Blue Streak*, 55.6 m.p.h. Other class "A" boats recorded their best runs this year, notably J. Innocent's *Betty* and K. Williams' *Faro*. E. Clark's *Gordon* 2 flipped badly on both runs ; each time the speed was well over 60 m.p.h.

Gems Suzor had very bad luck indeed at this regatta. The first attempt to start *Nickie IX* resulted in a flywheel key, shearing and Mons. Suzor was taken to the St. Albans club workshop where a new key was made in time for a return to the fray. Unfortunately, the engine would not behave properly, although a run of over 40 m.p.h was obtained. This is well below the speeds that have been recorded in practice, although it must be remembered that the boat is a new one. The engine is a two-stroke, with a typical "Suzor" look about it, and will no doubt make some high speeds in the future.

George Stone was another unlucky competitor ; *Lady Babs II* had to be scratched from the race due to damage sustained in the Hispano-Suiza race, and *Lady Cynthia* failed to return a time on either attempt.

In addition to four main prizes, there were additional prizes for the best speeds put up by "A," "B," "C" and "C" Restricted boats not qualifying for places. The following list shows these prize-winners as well as other good performances ;

(1) W. Everitt (Victoria), *Nan* ("C" Res.), 60.1 m.p.h., re-run 62.3 m.p.h.

(2) G. Lines (Orpington), *Sparky* 2 ("B"), 60.1 m.p.h., re-run. (——).

(3) R. Phillips (S. London), *Foz* 2 ("C"), 59.4 m.p.h.

(4) S. Clifford (Victoria), *Blue Streak* ("A"), 55.6 m.p.h.

B. Miles (Kingsmere), *Dragonfly* 3 ("C"), 55 m.p.h. "C" prize.

J. Innocent (Victoria), *Betty* ("A"), 54.7 m.p.h., "A" prize.

K. Williams (Bournville), *Faro* ("A"), 53.7 m.p.h.

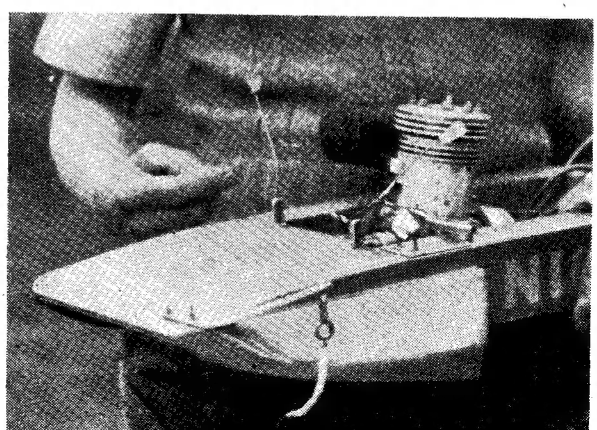
F. Walton (Kingsmere), *Jolt* 2 ("C"), 53.5 m.p.h.

J. Benson (Blackheath), *Orthon* ("A"), 53.3 m.p.h.

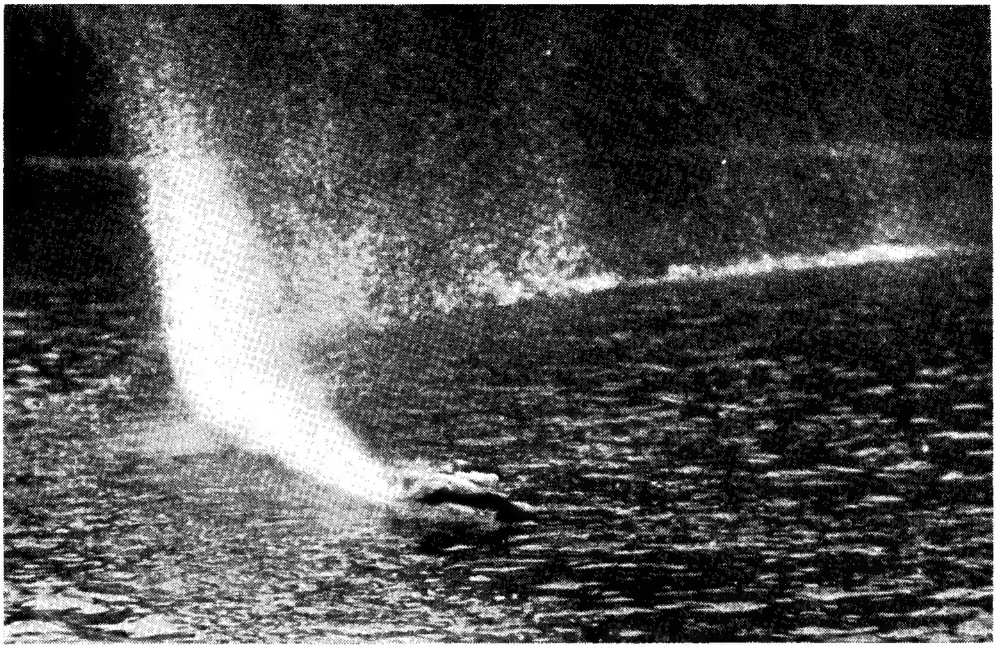
S. Poyser (Victoria), *Rumpus* 3 ("C" Res.), 52.7 m.p.h., "C" Restricted prize.

T. Dalziel (Bournville), *Naiad* 2 ("B"), 48.9 m.p.h., "B" prize.

The St. Albans Club are to be congratulated on the success of the regatta organisation,



The engine of M. Suzor's new boat "Nickie IX"



Mr. Everitt's " Nan " at full speed

which was excellent. A novel feature was a three-minute time clock, constructed by Mr. Davidson, of South London. This was large enough to be seen clearly by competitors starting their boats on the line, and was also fitted with a klaxon horn warning them when time was up! The results of both events show quite clearly that speed boat exponents in this country are well able to offer keen competition to our Continental friends, and it is to be hoped that we receive a visit from both Swiss and French competitors next year.

The photographs were taken by Mr. G. F. Croll, of St. Albans and District S.M.E.

An Automatic Cross-Feed for the Lathe

(*Continued from page* 306)

The backshaft is a piece of commercial ground silver-steel, $\frac{5}{8}$ in. diameter, shouldered down to $\frac{1}{2}$ in. at each end. It is slotted $\frac{1}{8}$ in. $\times$ $\frac{1}{8}$ in. for its full length, and is carried by two brackets bolted to the ends of the lathe bed. These are fitted with bronze bushes. These brackets can be of fairly light construction, as they take no thrust. All the thrust is taken by one or other of the horns on the plate *M*, so that it would be advisable to interpose two bronze washers between the horns and the ends of the worm.

In practise this device works very well. When facing from the centre outwards, a touch on the clamp-nut causes it to unscrew itself, while when facing inwards, no trouble is experienced in releasing the clutch, even though the knob has to be turned in the same direction that the screw is rotating.

A simple sheet metal cover which springs over the end of the boring table keeps swarf and dirt out of the gears. This should not be a fixture, as it is sometimes necessary to push it up out of the way to get at the control knob.

Some operators may dislike the idea of leaning over the lathe to operate a control at the rear of the machine, but I find that the usefulness of an automatic cross-feed far outweighs this slight disadvantage.

A Small Brazing Hearth

by A. Smith

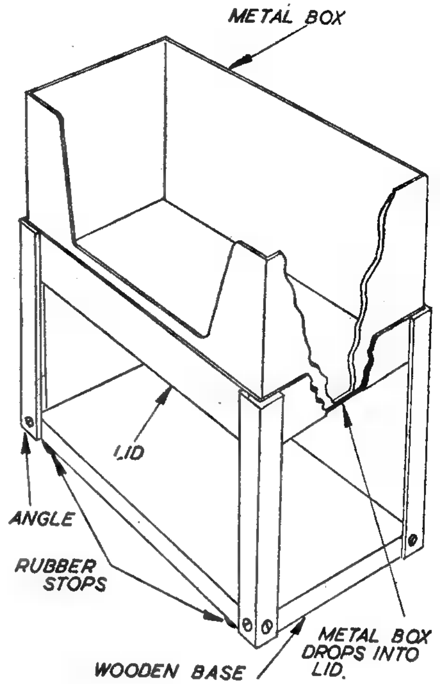
THERE is [illegible] doubt that the ability to hard-solder work together is of immense value in the workshop of the average model engineer, not only for the normal run of model work but also in the multitude of repair jobs that seem to [illegible] our way.

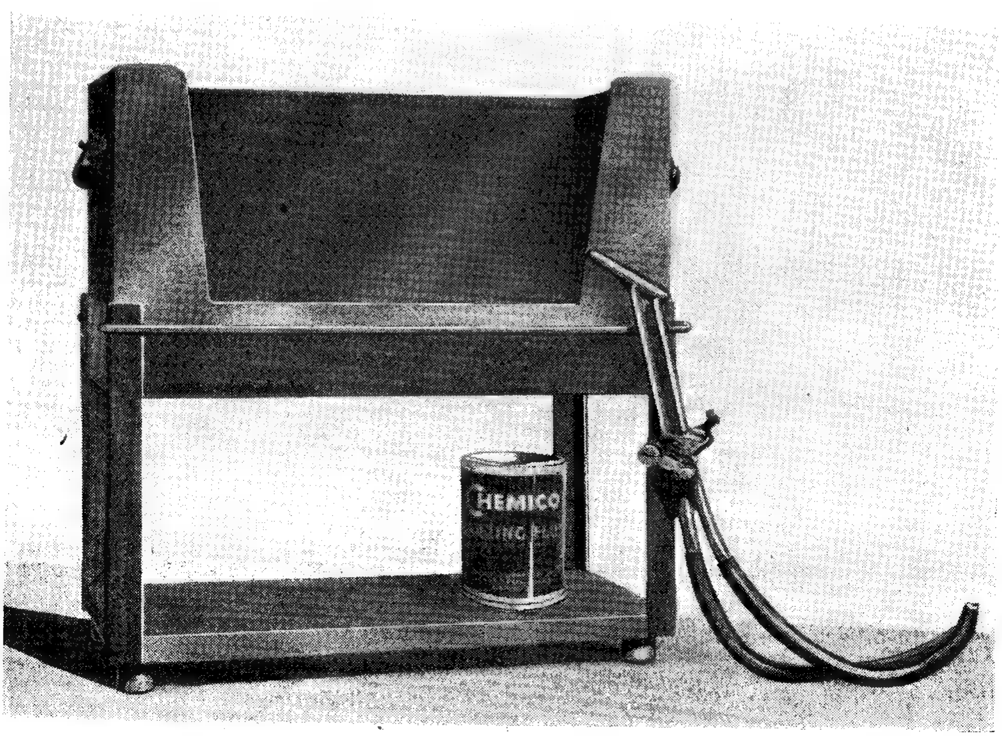
Frequently, although [illegible] air-gas blowpipe with its necessary air supply, or [illegible] blowlamp may be prominent amongst the equipment of the workshop, yet the hearth may be an extremely ramshackle affair, perhaps just a tin lid with a few pieces of coke, or just [illegible] couple of firebricks propped in [illegible] corner of the kitchen.

The illustrations show [illegible] very useful hearth made for the expenditure of 2s., possessing all the requirements of portability and access.

The metal box forming the hearth [illegible] an Admiralty pattern transit case, and was purchased from an *ex*-Government dealer for 2s. The front was cut out as shown by means of [illegible] hacksaw blade held in [illegible] padsaw handle. It was [illegible] noisy process but did not take long.

(*Continued on page* 314)





The Allchin "M.E." Traction Engine

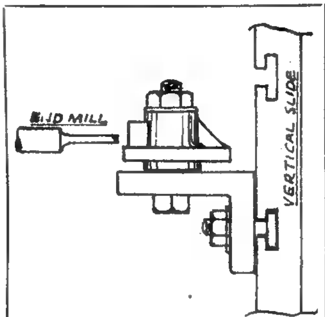
to $1\frac{1}{2}$-in. Scale

by W. J. Hughes

WHEN the boring for the left-hand third-shaft bearing is complete, the casting may be removed from the chuck for facing up the inside end of the spigot. This may be done with the casting mounted on a stub-mandrel, or on a mandrel running between centres. However, I did mine by gripping the outer spigot carefully in the three-jaw, so as not to damage the machined surface, and taking a light skim off the end. If you try to take a heavy cut, the casting will spin out of the chuck, damaging the already-machined spigot in the process.

Incidentally, the exact length of the inner spigot is not vital, and it can be a little more or less than the $\frac{3}{4}$-in. given in the drawing, without detriment.

For the recess in the oil-box, a plain $\frac{3}{8}$-in. diameter hole, $\frac{3}{16}$ in. deep would suffice, but it gives more oil capacity, and looks better, if the corners and bottom of the hole are milled out. This may be done, as sketched, by mounting the bracket on an angle-plate bolted to the vertical slide, using a bolt through the bore with nut and washer outside. A $\frac{1}{8}$-in. end-mill held in the chuck will then do the trick nicely.



Sketch to show method of end-milling oil reces

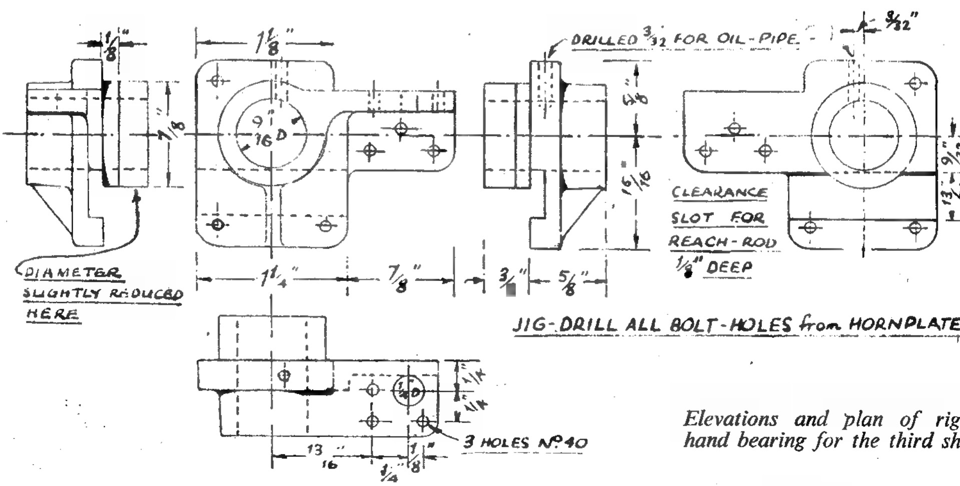
Drill a $\frac{1}{16}$-in. diameter hole in the bottom of the box through to the bore, and from it file or scrape a tiny groove inside the bore across the top, extending nearly but not quite to the edges. This will ensure that the oil gets to the whole bearing, instead of just to the centre of it.

The Oil Cap

To make the oil-cap, file a scrap of 18- or 20-gauge brass sheet until its fits nicely into the oil-box, and then sweat it as a spigot to a rather larger piece of sheet. File the rear edge of this to within $\frac{1}{16}$ in. of the spigot, and the other three edges to give a lap of 3/32 in. Round the edges, and drill a No. 60 air-hole through the lid.

Right-hand Third-shaft Bearing

The first part of the machining of the right-hand third-shaft bearing bracket is very similar to that of the left-hand bracket. Grip the casting in the four-jaw chuck, with the outer spigot running true. Turn the spigot to $\frac{7}{8}$ in. diameter by $\frac{3}{8}$ in. deep, at the same time facing up the bolting-surfaces of the flange and of the pump-platform. Then advance the tool very slightly—two or three thou.—and take a reducing cut over the outer end of the spigot for a length of $\frac{1}{4}$ in., thus leaving the inner $\frac{1}{8}$-in. of the spigot



Elevations and plan of right-hand bearing for the third shaft

Continued from page 179, "M.E.," August 7, 1952.

to full $\frac{7}{8}$ in. diameter. This, of course, is to make the spigot easier to insert in its hole in the hornplate, while at the same time the part left full diameter will be [redacted] good fit in the hole.

Now without moving the casting in the chuck, bore the hole out to $\frac{9}{16}$ in. diameter, using the plug-gauge you made for boring the left-hand bearing.

When the hole is correct to size, remove the casting from the chuck, and take a skim off the inner end of the inner spigot, either in the four-jaw or three-jaw chuck. This cut should also clean up the inner-edge of the pump-platform; the width of the platform when finished should be $\frac{3}{8}$ in., the same as the length of the spigot. In this operation again, only light cuts should be taken, so as to run no risk of damaging the outer spigot.

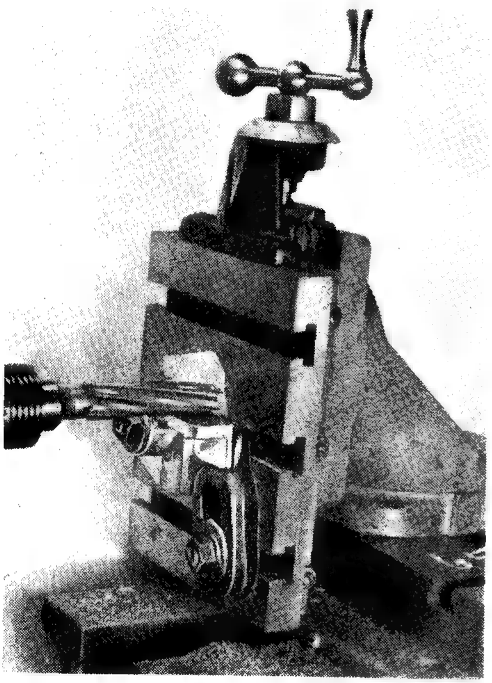


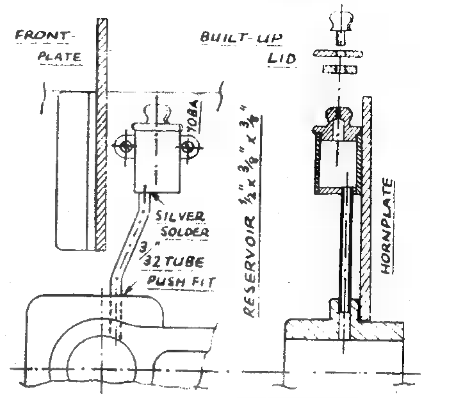
Photo by] *[The author*
Photograph No. 13. End-milling the pump-platform which is integral with the right-hand bearing bracket for the third shaft

Machining the Pump-platform

The surfaces of the pump-platform may be endmilled next, and photograph No. 13 shows how mine was done. The bracket was secured to the vertical slide by means of a single bolt through the $\frac{9}{16}$-in. hole. Note the piece of paper inserted between the casting and the surface of the slide to avoid bruising the machined surface of the former. Put [redacted] washer under the nut, and before finally tightening up make sure that the casting is mounted properly square.

In the photograph [redacted] cut is being taken over the upper surface of the platform, and it will be seen that [redacted] stop—in this case, a faceplate clip—is bolted beneath the casting in order to counteract the downward thrust given by the end-mill. When cleaning up e under-surface of the platform, and incidentally the inner-surface of the bolting face, this stop was fixed *above* the casting, of course.

The four holes in the pump-platform may



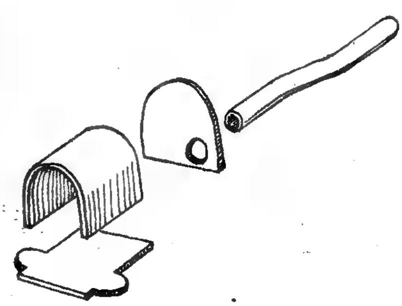
Arrangement of right-hand lubricator for third shaft

now be drilled, and also the 3/32-in. diameter hole for the oil-pipe, but the bolting-holes in the flange should be left for the time being. Again, a small groove should be worked by file or scraper from the oil-hole across the inside surface of the $\frac{9}{16}$-in. hole nearly to the outsides.

Finally, the clearance-slot for the reach-rod should be cleaned out. In the casting which Bro. Reeves sent me, it was cast in, and required very little cleaning-up; only the under-cut part under the spigot had to be removed, first with a tension-file and then with [redacted] small flat file.

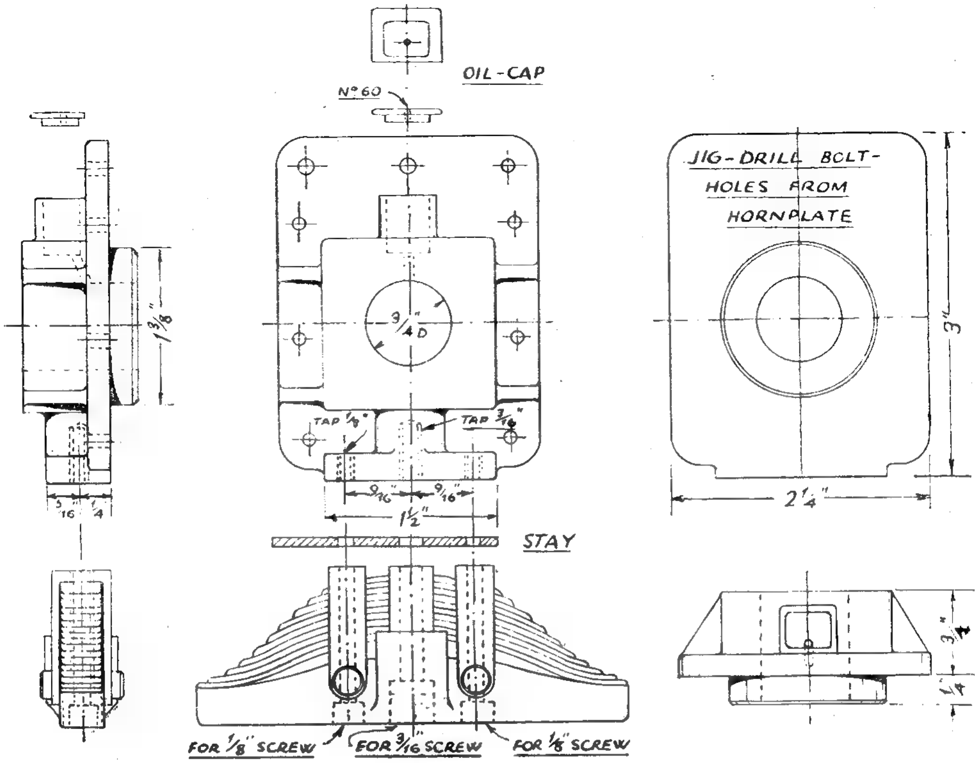
Lubricator

As mentioned earlier, a separate oil-box is necessary for the right-hand bearing, so [redacted] not to interfere with the pump. It can be silver-soldered up from three scraps of 22 or 24-gauge brass, as sketched, and the short length of 3/32-in. copper tube may be soldered in at the [redacted] time.



Sketch to show component parts of lubricator

The curved piece may be bent to shape round



Hind-axle bearing bracket, oil-cap, and dummy spring

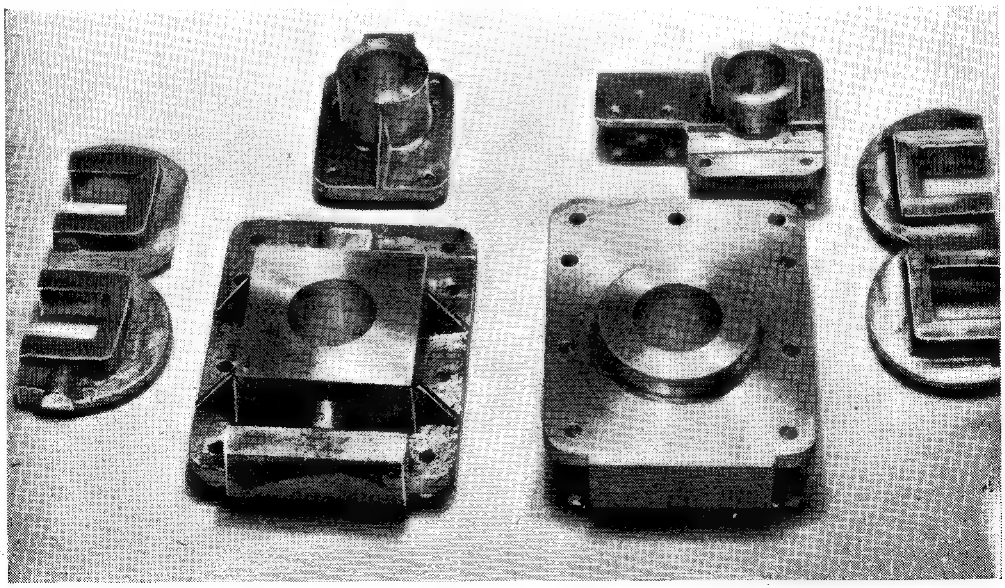


Photo by] *[The author*
Photograph No. 14. All the bearing brackets ready for temporary fixing to the hornplates

[redacted] stub of $\frac{5}{16}$-in. diameter rod, and the backplate and bottom should be left overlapping a little—the surplus can be filed off after silver-soldering. Wire the pieces together with thin iron wire, anoint the joints with flux, and solder with Easyflo. When cooled to black heat, remove the wire, and drop the oil-box in pickle.

Wash well and scour up ; then file off the overlap and clean up generally. Drill the two fixing-holes No. 50, $\frac{1}{2}$-in. apart.

The oil-cap is made in [redacted] similar manner to that for the left-hand bearing, but possesses a small knob turned from $\frac{3}{16}$ in. diameter brass rod. A $\frac{1}{16}$-in. diameter spigot on the knob fits into corresponding holes in the two pieces which form the lid, and the three are silver-soldered together. After pickling and cleaning up, grip the knob very lightly in the three-jaw chuck, centre the lid with [redacted] small centre-drill, and drill $\frac{1}{16}$ in. diameter to [redacted] depth of $\frac{3}{16}$ in. Then drill right through with [redacted] No. 60 drill to allow air to pass into the oil-box.

Leave the final bending of the 3/32-in. tube and the fixing of the oil-box until later.

Hind Axle Bearing Brackets

The bearing brackets for the hind axle are identical, and are machined in a similar way to the left-hand third-shaft bracket. First make a plug-gauge to $\frac{3}{4}$ in. diameter, then with the casting in the four-jaw chuck, turn the outside spigot to $1\frac{3}{8}$ in. diameter and $\frac{1}{4}$ in. long, at the same time facing up the bolting-flange. Bore the $\frac{3}{4}$-in. hole for the hind axle at the same setting, using the plug-gauge to size it.

Following this, remove the work from the four-jaw, mount the three-jaw on the mandrel-nose, and grip the outer spigot in the three-jaw in order to face up the inner side of the square boss on the bracket. This can be done with a knife tool or alternatively [redacted] round-nose tool set cross-wise.

To complete the bearing, it is necessary to drill and end-mill the recess in the oil-box, and to end-mill or file the palm at the bottom of the bracket where the dummy spring fits. This can be done with the work mounted on an angle-plate bolted to the vertical slide, [redacted] bolt passing through the central hole holding the work in place. Make sure that the machined face is at right-angles to the long sides of the bolting-flange, of course.

Finally, drill the oil-hole $\frac{1}{16}$ in. diameter, and work [redacted] oil-groove inside the bearing as before. Do not drill and tap the $\frac{1}{8}$-in. and $\frac{3}{16}$-in. holes at this stage, and do not drill the bolting-holes.

The oil-cap is made as before from two pieces, and [redacted] No. 60 hole is drilled to prevent air-locking.

Dummy Springs

On the prototype, the hind axle is mounted on springs as well [redacted] the front axle. The vertical movement, however, was limited to about $\frac{1}{2}$ in., and in order to allow for this vertical movement, the teeth of both the pinion and spur-wheel comprising the final drive were elongated so [redacted] to slide in each other. Those readers who have [redacted] copy of my book will remember the arrangement, and the general arrangement drawings of the prototype engine, obtainable from this office, also show the method of springing.

However, after duly weighing the pros and cons, I have decided *not* to spring the hind axle of the model ; the chief reason being that special cutters would be necessary to cut the special gears, whereas those specified may be cut with standard cutters.

At the same time, though, the springs [redacted] quite prominent on the prototype, and so on the model it is desirable to fit dummies. At the present time it is only necessary to clean up the castings for these, and to file the tops of the shackles square. Don't drill the fixing-holes until later.

Photograph No. 14 shows all the castings ready to fit to the hornplates. The three brackets in the right-hand half of the picture are the right-hand brackets, with the bolting and riveting faces uppermost. It will be noticed that the bolt-holes have been drilled ready for the fixing, and this will be the next job.

(To be continued)

A Small Brazing Hearth

(*Continued from page* 310)

The lid was put on the bottom to thicken this portion to resist the effects of heating. The side handles were retained to make the completed hearth readily transportable.

Four 8 in. lengths of 1 in. × 1 in. × $\frac{1}{8}$ in. angle were then cut and fixed with $\frac{1}{8}$ in. rivets, at each corner, riveting through angle, lid, and box. The base was cut from $\frac{3}{4}$ in. thick timber, planed to fit between the angle-iron legs, and held with round-head wood screws. After first staining with mahogany stain [redacted] coat of varnish was applied.

Four rubber door-stops were screwed underneath to act as feet, and amply protect any surface on which the hearth may stand. The base forms a useful shelf for brazing and heat treatment equipment. A length of $\frac{1}{4}$ in. diameter mild-steel rod was bent and screwed on the front to form a rail on which the blowpipe, tongs, prickers, etc., may be hung ready for immediate use.

The inside is lined with firebrick, while [redacted] coat of black heat-resisting paint covers all metal surfaces, which, with the stained base, gives [redacted] clean, business-like appearance to this useful addition to the workshop.

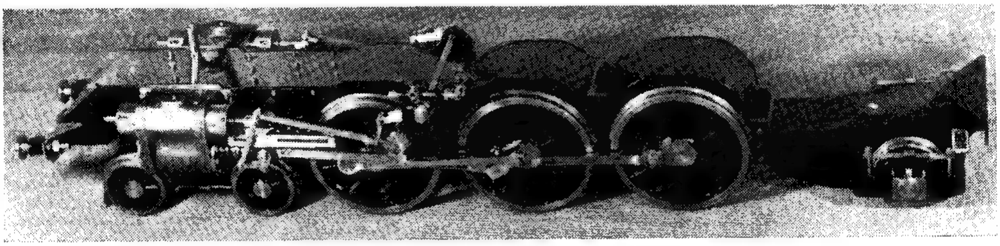
"L.B.S.C.'s" Lobby Chat

Mr. Buckle's "Britannia"

A FEW days ago, time of writing, I was having a friendly chinwag with one of my few personal friends on the subject most dear to our hearts, when he fairly startled me by remarking "Do you know, Curly, you are the most prolific locomotive engineer in the world—there have been more engines built to your designs than any full-size C.M.E.!" I was inclined to treat it as a joke, for the minute, but was staggered to realise that it must be the truth. Since these notes started, way back in 1924, I have put out more locomotive designs than even did John Chester Craven, of the L.B. & S.C. Railway in mid-Victorian days; but whereas the late J.C.C.'s engines, though diversified in type, were few in number, "L.B.S.C." engines are not only very plentiful, but scattered all over the world. Then my old crony rubbed it in, in a manner of speaking, by adding "AND there'll be a darned sight more *Britannias* running around on 3½-in. gauge rails, than ever there will be on 4 ft. 8½ in.; in our lifetime, anyway."

I gave him best! At the time of writing, there are 25 British Railway class 7 standard engines running; but when the little ones now building, are finished, there will be more than ten times that number on 3½-in. gauge. Not only from my huge correspondence, but from information from our advertisers, of the castings and material sold, that fact is quite plain. Some of the builders are keeping up to the instructions; and photographs are beginning to come in, of progress to date. The most advanced job that has so far come to my knowledge, is that of Mr. H. Buckle, a member of the Romford club; and three photographs of his engine taken just previous to time of writing, are reproduced herewith. You can see what a grand job he is making of it.

In his accompanying letter, Mr. Buckle kicked off with an appreciation of these notes, for which I bow gratefully. He says that he hasn't had much experience in the small locomotive-building line, his first job being the gauge "O" *Bat*, which I described during the war years, as an easily-built and inexpensive job which could be run indoors on a portable track during blackout hours. This engine is still running, and has afforded his two sons many hours of amusement. As regards *Britannia*, he has practically kept up with the instructions and drawings, and everything has gone like marriage bells. Preliminary tests have already been carried out under compressed air; and to quote from his letter, "results have been very encouraging, speed ranging from a very steady tick-over on 5 lb., to hell-let-loose on 40 lb."



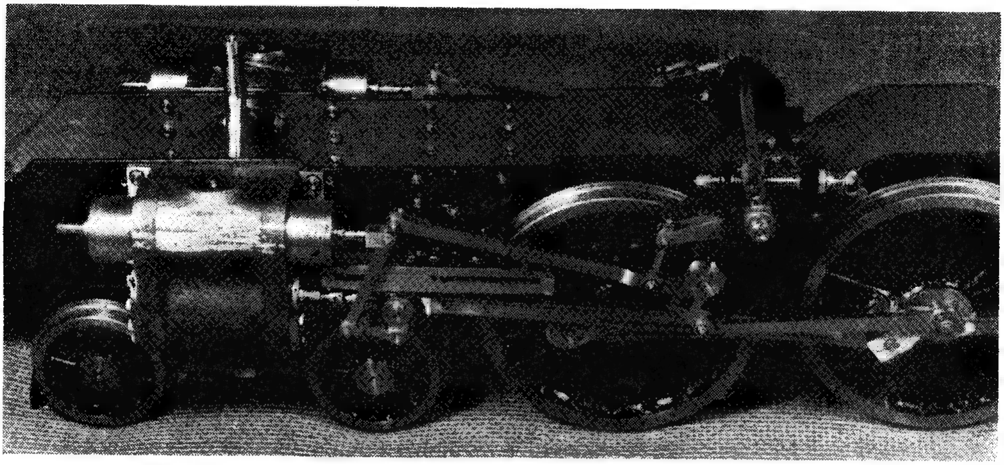
Mr. Buckle keeps pace with instructions

This engine, anyway, is going to have some competition! Mr. Buckle says that his elder son, aged 15, has made a start, entirely on his own account, on the 3½-in. gauge *Invicta*; and by dint of expending much energy plus a few of his dad's hacksaw blades, has (at time of writing) completed the frames. When the engine is finished, he proposes to chase *Britannia* around the 600 ft. continuous run of the Romford club track. Well, just to encourage him, I'm going to say right here, that the big engine won't find it as easy as it might seem, to keep ahead of the little "old iron." If the workmanship is reasonably good, and the valve setting correct, the only speed limit of the "ancient and honourable" will be that at which it can stop on the road; so things should hum, in more senses than one! Hearty congratulations to the locomotive-building firm of Messrs. Buckle & Son, and here's wishing their efforts every success.

Sliding Firehole Doors

Talking about *Britannia*, several builders want to know if I will be able to describe a sliding type of firehole door for the boiler, as they would like to fit this kind if practicable, and follow full-size practice. My experience, so far, with sliding firehole doors, is that they are not so handy to use, when the engine is running, as the swing type, as they tend to stick in the grooves when opening, and coal-dust chokes the grooves and prevents closing, if the coal is accidentally spilt when firing, as it usually is. Anyway, I always do my best to oblige; and if I can wangle

out ■ double sliding firehole door that is reasonable free from sticking, and suffering from choked grooves, I'll give it as an alternative. There is, however, a compromise that presents itself. If it is merely for the sake of personal appearance that the sliding door is required, there is nothing to stop any builder from making an exact copy of the firehole door on the full-sized engine, and hanging the whole bag of tricks on a hinge. You then get the required appearance plus the convenience of the swing door. I have yet to understand why some folk object to the swing door, and contemptuously liken it to the door on the domestic copper, which is an indispensable part of the wash-day ritual. The reason why the kitchen copper (which is, after all, a non-pressure boiler) has a swing door, is because the latter is the most suitable for the job. I wonder what the housewife would say, if her copper had ■ double-slide door that continually stuck, and she had to rake ashes and coal-dust out of the grooves every time she wanted to put a bit more coal on !



Close-up of cylinder and motion

Outside Stephenson Valve Gear

A reader who is trying to build an old-time French Crampton engine, "a cross between a tar boiler and a baked potato can" he calls it, says that he has no drawings, but is working from a couple of old photographs, and making the working parts according to "L.B.S.C." principles. It was the quaint-looking job shown in the photographs that started him off ; and progress is so far satisfactory. What is puzzling him, at present, is the arrangement of valve gear. He says that it looks like Stephenson link motion, with the eccentrics hung on ■ return crank, but he doesn't know how to set it out, or how the offset of the crank is arranged ; so can I please do the needful ?

As I've never described an outside arrangement of Stephenson link motion, I thought maybe a simple expanation might be interesting to lovers of these old-time contraptions. There is nothing complicated at all ; and the gear is, as ■ matter of fact, easier to make and fit than one between the frames. There is no offset at all, to the return crank ; it is set with the crankpin dead in line with the centre of the driving axle. It merely revolves, without moving off centre ; and to all intents and purposes, it is just an extension of the driving axle beyond the main crank. That being so, it naturally follows that the "rules and regulations" applying to an inside valve gear, apply equally to the outside version ; and the latter has certain advantages. One is, that as the return crankpin carries no engine weight, but merely has to support the eccentrics and drive the valves, it can be made of very small diameter compared with the driving axle. This means that the eccentrics themselves need only be large enough to embrace the pin, and strap friction is considerably reduced. Only ■ small expansion link is needed, the die-block being placed on the pin in the valve crosshead or fork, eliminating all intermediate rods, rocking or pendulum levers, and what-have-you. The expansion links ■■■ raised and lowered by a pair of lifting links suspended from lifting arms on the ends of an ordinary long weighbar shaft as used for the Walschaerts gear.

Outside Stephenson link motion enjoyed great popularity on the Continent, before it was superseded by Walschaerts gear ; one reason being its accessibility, and another being that it could be made smaller and lighter than an inside gear of similar capacity. But it never gained favour in this country, and there are only ■ few recorded instances of its application ; for example, one of the G.W.R. Dean experimental single-wheelers (No. 9) had it, and there were ■ few engines in which the cylinders were inside the frames, and the steamchests outside, notably the Shrewsbury and Hereford "Vulcans" of the middle 1850's. There were only six of them, something like *Jenny Lind* in appearance, but the eccentrics were outside the driving-wheel bosses, and the expansion links worked on die-blocks in the

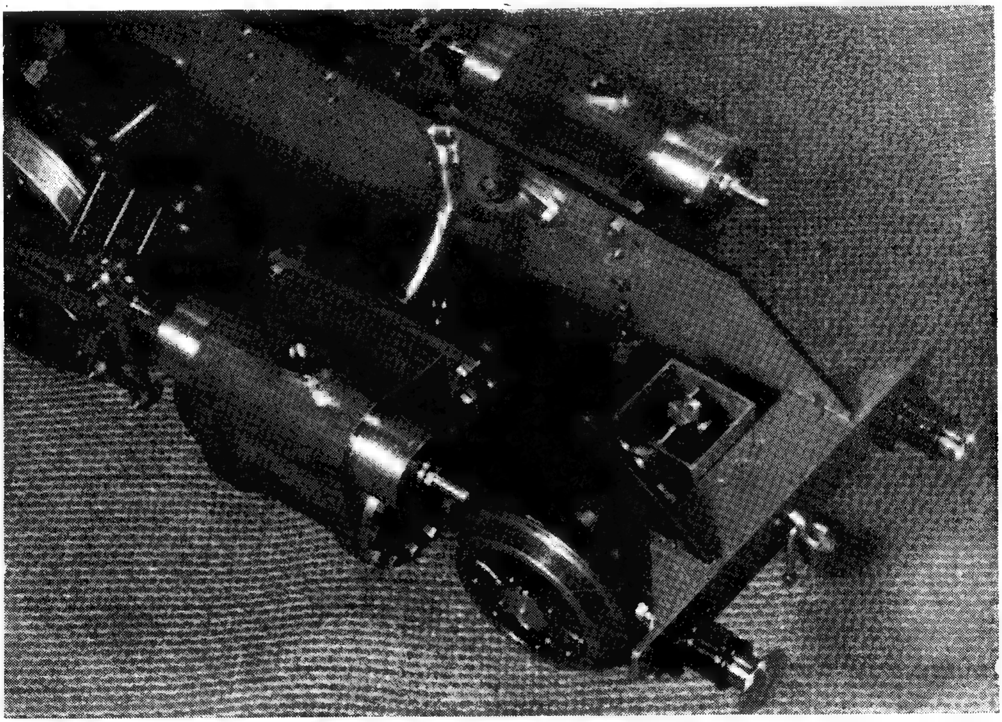
forks on the ends of the valve spindles projecting from the outside steamchests.

The L.M.S. Class 5

Correspondents have also referred to the L.M.S. Class 5 engine that was experimentally fitted with outside Stephenson link motion. I have heard varying tales about this. Some say she was better at high speed, owing to the advanced lead given to the valves when notched up ; but at the present time, when the craze is just " standardisation at all costs," I shouldn't be surprised to hear that she had been altered to a B.R. standard Class 5, with Walschaerts gear. Speaking of " standardisation," it wouldn't be a bad idea if British Railways standardised a wee tank engine about the size of a Brighton " terrier," for certain jobs. One evening last June, I took an after-tea trip on the gasoline buggy, to New Romney, just to say how-do to George Barlow (foreman driver of the Romney, Hythe & Dymchurch line) and his fair lady and two lovely kiddies. Coming back, I stopped at the level crossing at Appledore to let a train go by. Some train—a Class 4 L.M.S.-type 2-6-4 tank hauling—hold your breath—*two coaches* ! It batted past at better than a mile-a-minute, shaking the ground like a miniature earthquake ; and I thought, what a waste of power. The right engine for that job would have been old *Stepney*, the darling of my early childhood. One of her sisters, *Poplar* " as was," is still doing her stuff on the Kent and East Sussex line. Anyway, referring back to the outside Stephenson gear, I'll try to find time, all being well, to squeeze in a drawing, which could be adapted for use with any engine for which the gear might be suitable.

Little Things that Mattered

Readers often tell me in their letters, that they enjoy reading accounts of unusual happenings on my little railway ; so they may be tickled somewhat if I relate what happened on a recent Saturday afternoon. The information may also provide a clue to the solution of similar trouble which might happen on their own lines. It came to pass that a couple of old friends whom I had not seen for a considerable time, brought an engine for a run on my road. She was a pretty little thing, originally starting life as a tank engine, in the early days of these notes. Progress was very slow, the builder's daily occupation causing him to change residence frequently ; and when I had brought out a fresh design, maybe something in it would appeal to our friend, and he would incorporate it in his own job. The consequence was that she had the frames of one engine, wheels of another, cylinders and valve gear of something else, and so on. However, she was finished at last, and ran all right for some time ; but as a tank engine she was awkward to handle, the firehole, regulator, lever, etc., being all inaccessible on account of the rear cab sheet, and the bunker. It was therefore decided to convert her to a



Note details and finish

tender engine.

The frames were shortened, after removal of the bunker, and an open-backed " main-line " cab fitted in place of the original closed cab. A tender was made up, according to specification in these notes, and various alterations to pipework and connections made, to suit the conversion. Although by this time our friend had quit roaming and settled down, he hadn't a decent line for the engine to show her paces, and asked if he could give her a run on my road ; and in due course he brought her along.

A Flop

The engine, as now constituted, is a $2\frac{1}{2}$-in. gauge 4-4-0 with a distinct flavour of Swindon about her. She has outside cylinders, with the type of link motion that I described for *Lady Kitty* ; a taper boiler with Belpaire firebox, the grate of which is $4\frac{3}{8}$ in. long by $1\frac{1}{4}$ in. wide ; the tender is the same as *Purley Grange.* Steam was raised by aid of my electric blower in the usual four minutes or so, but when the engine's own blower was turned on, it didn't seem to have any great effect on the fire. The pressure rose very slowly, the fire looking half-dead. Anyway, eventually the needle of the steam gauge arrived at the 80 mark and a start was made ; but, alas ! the steam pressure rapidly fell, and she had to stop for want of breath, after doing just one lap. After blowing up again, she did another lap, and again conked out. Neither blast nor blower seemed to have any decent pull on the fire. I thought that maybe the smokebox was drawing air, but the builder said no, he had made certain that all air leaks were stopped. Then I suggested a steam leak in the smokebox as the electric blower pulled the fire all right ; but this also proved a false alarm. It wasn't the coal, as she was burning the same coal I use in my own engines, so I suggested throwing the fire out, sweeping the tubes, and making a fresh start altogether. This was done, and as some oily black stuff came out of the tubes, I thought maybe she would steam better ; so she was lit up once more, but the results were exactly the same, and our friend was a bit downhearted.

Magic !

The three of us—self, and owner, and the other friend—stood around her discussing matters ; the owner reckoned that the valve gear was about done, and said he would make her a new gear, same as I described for *Purley Grange.* Then suddenly I said " Let's have a look in the smokebox," so our friend opened the door ; and as soon as I looked in, the trouble was shot. The blastpipe and blower nozzles were far too high, almost level with the bottom of the chimney liner. I told the owner to unscrew the blastpipe nozzle and bend the blower pipe down (it had the usual swan-neck) to about 1 in. below the liner, whilst I went indoors and fixed up a short blast nozzle. As luck would have it, I found a suitable one in the oddments box, which only needed the threads cleaning out with a tap, a work of a minute only. This was screwed on to the blastpipe, roughly tested for alignment with a taper broach put down the chimney, and the blower nozzle relocated alongside it. The fire was lit once more, and I whispered the magic incantation of childhood days " ein timmin ongyeiron " just for luck, whilst she was getting up steam.

Oh, what a difference in the morning—or rather afternoon ! As soon as there was enough steam to work the blower, the electric gadget was taken off, and the blower valve opened. The steam gauge absolutely " walked up " and in a few minutes she was blowing off. The owner sat on the car, opened the regulator and off she went. This time, instead of steam pressure dropping, it was a case of keeping her quiet ! The eccentric-driven pump had struck work (probably due to a stuck or leaking valve) and the only means of feeding the boiler was by the hand pump, so the owner had to get busy with both hands, holding the tender on the road with one hand whilst he frantically waggled the pump handle with the other. One of the pistons was blowing so badly that the exhaust gave two beats and two loud roars per revolution ; but the engine went—I'll say she did ! Owing to the engine and tender being too closely coupled for my curves, the tender came off the road at the bottom of the bank at the north end of the line ; and when the driver stopped to put it on again, the safety-valve blew off skyhigh. Despite the awful piston blow, the engine restarted all right on the bank, and nearly blew the chimney off the smokebox as she accelerated, the boiler making steam at such a rate that the water was being evaporated nearly as quickly as it was being pumped in !

Naturally, it was too much of a good thing, running under those conditions, so the fire was soon allowed to die out, and we adjourned to my workshop for a cup of the enginemen's best friend, and a chinwag over events. The owner of the engine is going to see to the defective pistons and valves, put the eccentric-driven pump in order, and fit larger water pipes, also ease out the coupling between engine and tender, to allow more flexibility on curves. Then she will be coming along for another run. One thing is certain ; she won't be short of steam any more. As I have always said, it is the little things that matter ; just the mere fact of altering the position of the blastpipe and blower nozzles in relation to the chimney liner made all the difference in the world between success and failure. For the guidance of any follower of these notes who has an engine that is a shy steamer, a good general rule for the draught arrangement, is to divide the diameter of smokebox into three ; that gives the approximate projection of the liner into the smokebox, the height of the blast nozzle from the bottom of the smokebox, and the gap between nozzle and bottom of liner. There are, of course, other factors, such as diameter of both nozzle and liner, and height of chimney above smokebox, which have a bearing on results ; but the above is a good basis from which to start.

Tail Lamp

Two visiting friends, noticing the second-class coaches in a passing Newhaven boat train, remarked that the ticket inspectors must have had a job in the days when all trains were first, second, and third. They were amused when I told them that L.B. & S.C. railwaymen said " First class passengers are toffs, thirds ordinary people, but seconds are ordinary people who fancy they are toffs ! "

Making a Workshop Camera

by "Dioptre"

THE construction of the camera will be found interesting, as it includes a variety of simple woodwork as well as metalwork of many kinds; in addition, the appearance of the finished camera will be improved and will have a more professional look if the wooden parts are French-polished and many of the metal components are finished with the preparation used in instrument work, and known as "optical black."

After the surfaces of the wood have been planed flat and square and the upper edges chamfered, the two end-pieces or legs are attached by means of screws inserted from below. If the screw heads are let in for some distance by counter-drilling, there will be no need to use screws longer than, say, 1½ in. The four rubber feet, of the kind fitted to the under side of lavatory seats, can be obtained from the ironmonger.

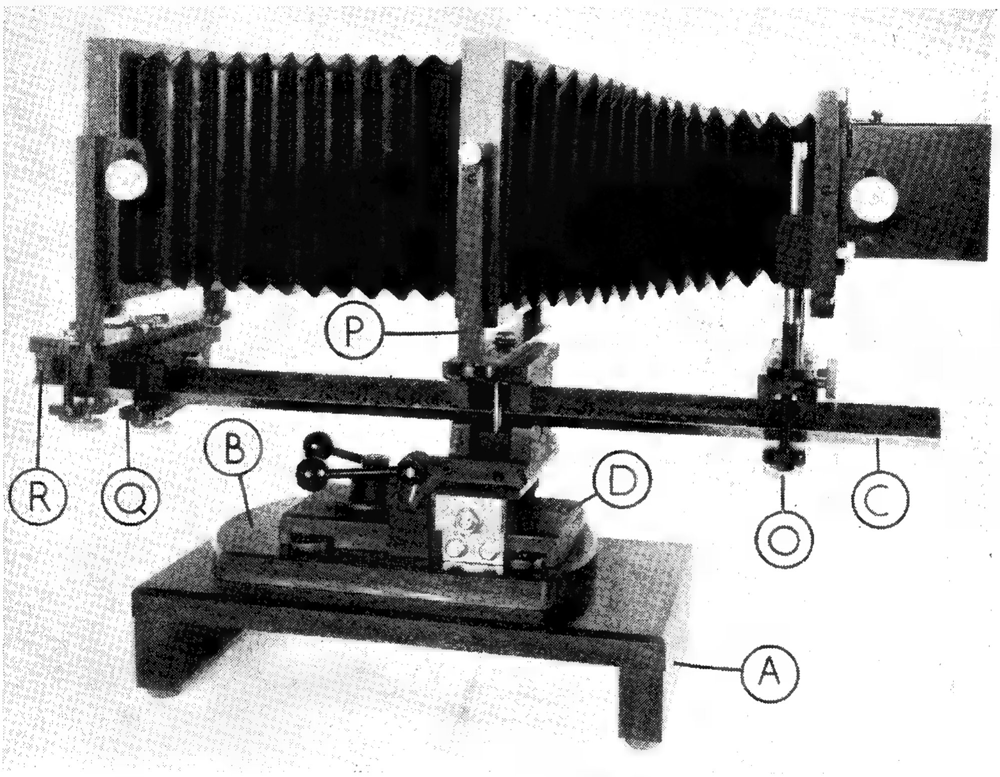


Fig. 4. "A"—baseboard; "B"—wooden sole; "C"—bar bed; "D"—baseplate; "O"—front slide; "P"—bellows fork; "Q"—back slide; "R"—focussing slide

The Baseboard—A

Although a start may not necessarily be made by building the wooden base on which the camera stands, a description of the construction will be simplified if the parts are dealt with by working from below upwards. As shown in Fig. 5, the base is of stout construction to ensure rigidity. As no mahogany of the right size was available, oak was used for making the baseboard; but well-seasoned soft wood will serve equally well.

Continued from page 249, "M.E.," August 21, 1952.

The Wooden Sole—B

This should be made of the same kind of wood and is finished to the shape illustrated in Fig. 6. Both this part and the baseboard are drilled to pass the ⅜ in. dia. clamp-bolt (*G*) that locks the sole in position after the camera has been aligned on the object.

As the rest of the woodwork of the camera is made of mahogany, the baseboard and sole should be stained to this colour before being polished. To prepare the wood, the surface is first brought to a smooth finish with fine glass- or garnet-paper. Next, the required colour is

obtained by treatment with a mahogany stain, and for this purpose a spirit stain should be used, as it does not raise the grain of the wood like a water stain. For staining, filling, and polishing, the Amatrix brand of products have been found to give excellent results with but little labour.

When the stain has dried, the pore-filler is applied in accordance with the directions given on the tin, and as soon as it is dry, the filler is well rubbed with a rag to leave a smooth surface on the wood. Those who have not done any French polishing will, however, find that there is no great difficulty in obtaining a satisfactory finish. The process is briefly as follows: a small lump of cotton wool is moistened on one side with the polish and, to make the so-called rubber, the wool pad is wrapped in a double thickness of linen or calico; old sheeting is best, as it is free from fluff. The rubber is now worked all over the surface of the wood with a circular motion and, from time to time, the covering is removed and the wool recharged with polish. When a satisfactory polish has been obtained, the rubber is worked over the surface in a series of straight lines until the wool becomes almost dry. The final operation is termed spiriting-off and consists in going over the work with a fresh rubber, charged only with methylated spirit or rectified spirit, in order to obtain a smooth and highly polished surface.

A demonstration by a skilled French-polisher will, however, be found much more helpful than any written description of the process.

This is all the woodwork for the present, and the metal parts will now be finished before the wooden components of the camera itself are made.

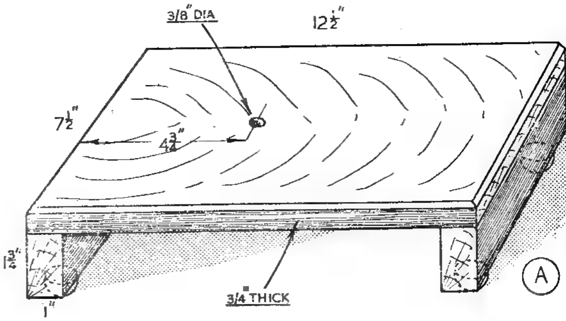


Fig. 5. The baseboard

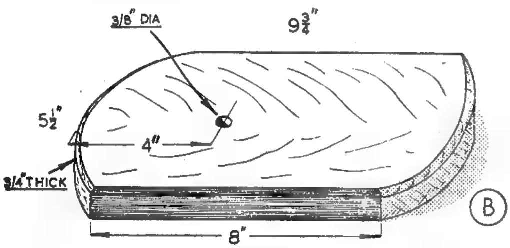


Fig. 6. The wooden sole

The Bar Bed—C

At this stage the bar bed can be made and finished. This bar is a length of ⅞ in. square mild-steel, mounted with its diagonal set vertically in order to afford accurate guidance for the sliding V-blocks carrying the optical components of the camera. The length of the bed is determined by the focal length of the lens fitted, in conjunction with the magnification of the object required, as explained in the previous article. In the present instance, the bed has been made 24 in. in length so that when using a lens of 8 in. focal length an object can be photographed twice full-size. On the under side of the bar a flat, approximately ½ in. in width, is formed to give a bearing for the clamp-screws fitted to the sliding V-blocks.

The sides of the bar should be carefully draw-filed to maintain squareness, and these surfaces may be finished by frosting with a hand scraper.

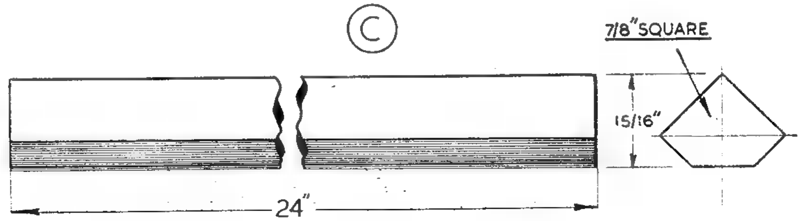
The Baseplate—D

This is an iron casting, but a length of steel plate could be used instead, although it would not, perhaps, have such a workmanlike appearance. It so happened that a baseplate designed for a drilling machine was found in the scrap box, and this was used, as it seemed to be exactly what was wanted.

We understand that Mr. Haselgrove will be able to supply this casting as well as the others required for constructing the camera.

Very little work needs to be done on the casting, but the underside of the feet should be filed flat so that the part rests evenly on the surface plate. The feet are also drilled to take wood screws, and a 13/32 in. dia. clearing hole is drilled in the boss for the passage of the clamp-bolt. In addition, the sides of the casting are filed square to form seatings for the base clamp-plate (*F*) and the two side plates on which the camera pivots; these parts will be described later, but in the meanwhile

Fig. 7. The bar bed



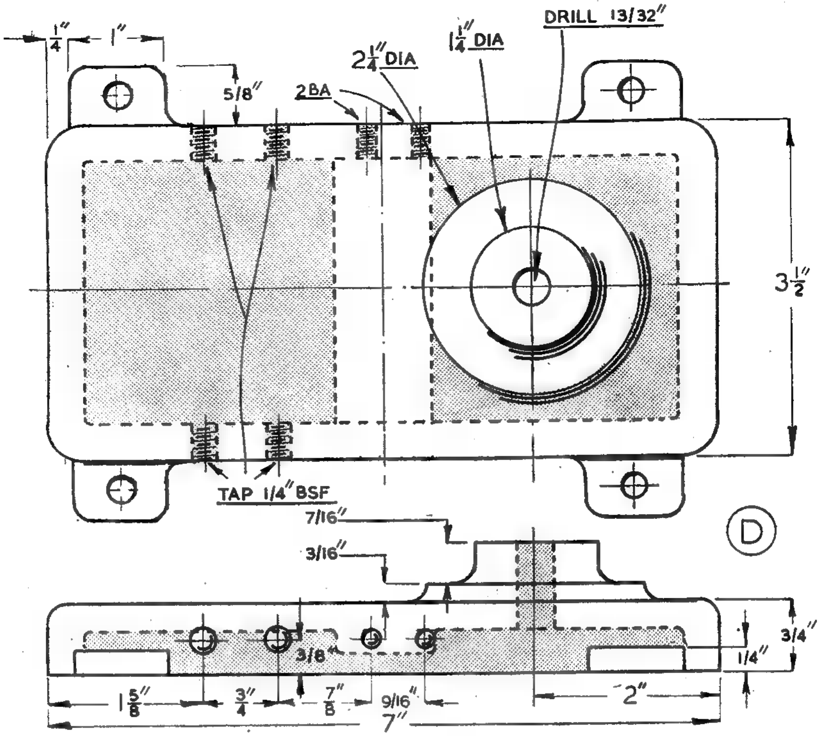


Fig. 8. The baseplate

the holes for their attachment screws can be drilled and tapped in accordance with Fig. 8.

The Base Clamp-bolt—G

When assembling the wooden sole (*B*) [illegible] the baseboard (*A*), a thin disc is placed between the two parts in order to give free and smooth working when the camera is traversed. This disc [illegible] be cut from celluloid of plastic sheet to [illegible] diameter equal to the width of the sole.

The clamp-bolt and its parts are made to the dimensions given in Fig. 9, and the method of fitting is illustrated in Fig. 10.

The bolt itself is turned from [illegible] length of ½ in. dia. round mild-steel, and two spanner flats [illegible] filed on the head.

The handled clamp-nut is built up, and it should be noted that spanner flats are formed at the outer end of the ¼ in. dia. lever [illegible] an aid to assembly. To fit the clamp lever to the bolt, the nut itself is first screwed home and, after the lever has been screwed into place, the plastic knob is finally fitted. This mode of assembly is necessary, [illegible] the clamp lever is too long to turn when the

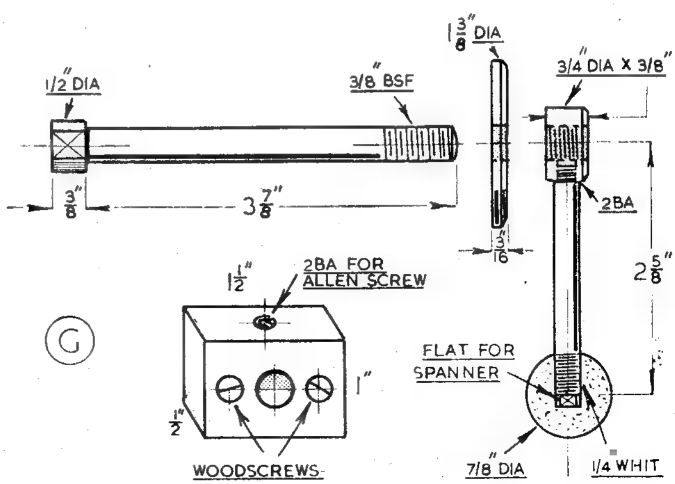


Fig. 9. The base clamp-bolt

other components are in place on the baseplate.

For use when traversing the camera, the clamp lever should be placed so that it can easily be operated with the left hand. Therefore, to allow the position of the lever to be quickly and accurately set at the time of assembly, the clamp-bolt is made to turn in a plate attached to the under side of the baseboard with wood screws. This plate, as shown in the drawings, is drilled and tapped for a 2-B.A. Allen grub-screw, which locks the clamp-bolt after it has been turned to bring the clamp lever into the right working position. To give a tidy appearance, a special washer should be turned to form a capping on the circular boss through which the clamp-bolt passes.

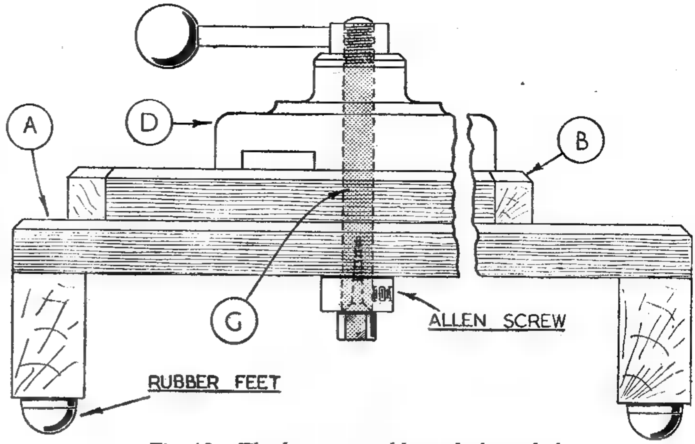


Fig. 10. The base assembly and clamp-bolt

The special black lacquer, used for painting the metal components, is liable to be damaged by the nuts of the clamp-bolts fitted for controlling the camera movements ; but this can be largely overcome by fitting a celluloid washer under the nut. The sheet celluloid used for motor-car screens will serve well for this purpose, and, after the washers have been punched out, their rough edges should be smoothed with glass paper to prevent scratching.

(*To be continued*)

HORSELEY BRIDGE

We are inclined to wonder whether the heading to this paragraph conveys very much to any but a few of our readers ; yet, years ago, as now, it was a name that loomed large in the engineering world. We are indebted to Mr. F. T. Griffiths, of West Bromwich, for having loaned to us an interesting reprint of an article which was published in *The Express and Star* on November 12th, 1932. The article gives a short account of the history of the Horseley Bridge & Engineering Co. Ltd., and reveals a number of interesting facts concerning that famous Tipton firm.

It may not be generally known that 100 years previously, that is in 1832, the Horseley Bridge & Engineering Company was managed by no less a person than Isaac Dodds, who was then about 30 years of age. Under him, the company produced railway material, including many locomotives which embodied improvements and innovations invented, or at least recommended by Dodds. Later, this remarkable inventor produced the first machine for rolling plate glass ; received the Society of Arts silver medal for an improved parallel motion for marine engines, and a second silver medal for inventing the fusible plug for preventing boiler explosions. Then came improvements to firearms, machinery of various kinds and much railway building, together with many patented inventions.

With such a man as this as its manager, there can be little room for surprise that the Horseley Bridge & Engineering Co. Ltd. grew into a large and influential concern. During the next fifty years, the company was responsible for the construction of : more than 100 bridges for the Great Central Railway from London to Loughborough ; Rugby and Leicester stations ; the Palace Theatre, London ; Leadenhall Market ; Paddington Station ; Charing Cross railway bridge ; swing bridges at Lowestoft, Millwall and Tilbury ; Harwich pier, and jetties at Port Elizabeth, Sekoudi, Dom Pedro, Port Harcourt, Port Swettenham and Penang, as well as hundreds of bridges, steel building, gas-holders and the like all over the world. Modern developments include such things as steel pylons for electricity supply lines.

Today, the business is carried on under the name of Horseley Bridge and Thos. Piggott Ltd., with extensive premises in Birmingham and Tipton.

THE MECHANICS OF RADIO CONTROL

by Raymond F. Stock

IN the unit shown in the illustration, Fig. 11, one of the spare contacts operated a solenoid in the engine room for the purpose of cutting the fuel supply to the i.c. motor. This required no delay action, as there was an inherent time lag between operation and final stopping of the motor. The other spare circuit contained an electromagnet which released a towline and this operated instantly. To prevent it releasing the first time the wiper arm passed the appropriate contact, the delay device was included. It

A selector-operated control unit of this general nature is perhaps ideal in a larger, slower type of ship model, and given sufficient displacement a standard post-office 4-bank selector with suitable power supplies can operate almost anything ; its speed of operation is certainly faster than one can key the transmitter manually.

Small models may also be fitted with a selector device, though the normal ratchet-operated unit in Fig. [illegible] is a little tricky to adjust if scaled down and generally takes a disproportionate amount of

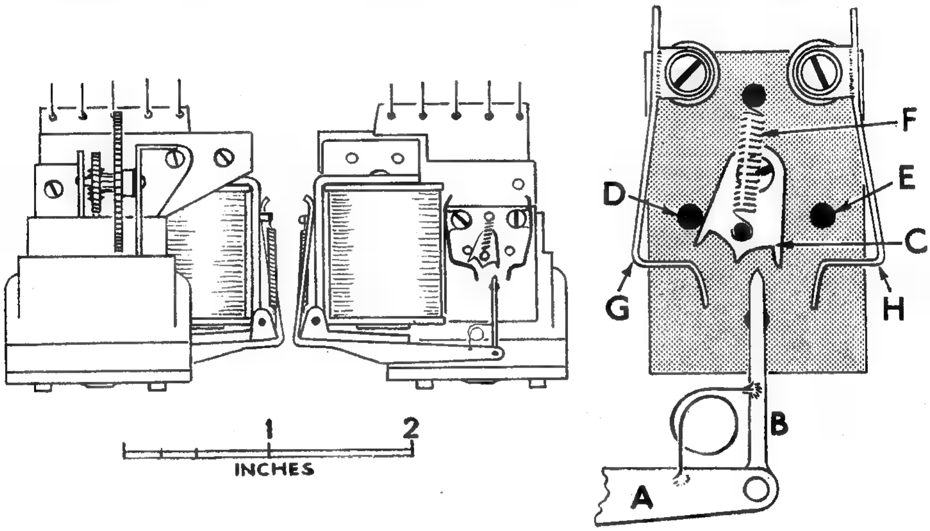


Fig. 12. *Self-contained selector and steering unit, front and back view. Right—enlarged view of selector mechanism*

consists of an aluminium drum (cut from a 35 mm. film container) with a piece of balloon rubber stretched over the open end and retained by cement and a binding. The can was pierced and the hole covered by a rubber flap-valve which permitted the diaphragm to be easily depressed, but by its (nearly) non-return action delayed the recovery of the diaphragm by about $\frac{3}{4}$ sec. The diaphragm was depressed at each step by an arm on the selector, and when stepping quickly from one position to another the contacts **V** and **W** (Fig. 11) never touch. These contacts are, of course, connected simply in series with the appropriate " spare " position.

The circuit of Fig. 10 is based on the use of a single motor and selector bank, and two batteries ; similar arrangements can, of course, be included in either of the other layouts shown in Fig. 9. A separate battery is shown for operating the "spare" positions.

Continued from page 273, " *M.E.*," *August* 28, 1952.

power. Casting about for a substitute to fit in a very small model, I recently hit on the idea depicted in Fig. 12. The operating magnet takes only 150 mA at 9 V ; its armature **A** carries a blade **B** which is deflected (when it descends) to either one side or the other by toggle plate **C**. The latter is moved by the blade as far as stops **D** and **E** and held either way by toggle spring **F**.

The end of the blade carries a silver rivet which contacts alternately bronze wires **G** and **H** ; when the armature is not attracted, no contact at all is made, so the selector is really three-way.

As shown in Fig. 12 the selector is combined with an electric motor and gearing to form a self-contained steering unit. The circuit is given in Fig. 13.

This device certainly suffers from the lack of a definite " homing-central " position (and limit switches), but as it is fitted in a very small simple model this is perhaps excusable.

The basic idea of this selector is in any case applicable to many other functions where a choice between either two or three positions is

required. If only two positions are needed, the moving contact could be on the toggle plate, thus obviating current drain for the electro-magnet except momentarily while changing from one position to the other.

Control Power

So far, electric motors have been shown [redacted] the source of mechanical power for steering control, and they are certainly very convenient. In steam or i.c. powered models, however, there exists a source of mechanical power too often ignored—I refer to the rotation of the propeller shaft. Some form of electromagnetic clutch can usually be devised to pick up rotation—perhaps in either direction—and transfer it to the rudder. This is very useful in the smallest i.c. powered models, as it reduces the battery power (and weight) to be provided.

As [redacted] example of the simplest gear, I can refer back to one of my own models. This already had a worm reduction gear from the propeller shaft driving a water pump at 1 rev. per sec. The shaft of this unit was extended and fitted with [redacted] friction-driven ratchet wheel. The latter was released by [redacted] normal type of escapement (as described earlier), but it was found that a simple pawl could be used instead of [redacted] claw assembly to release the wheel, since the speed of the latter was controlled. It was merely necessary to ensure that only short pulses were transmitted. This idea, shown in Fig. 14, is admittedly inefficient in throwing [redacted] constant loading on the motor, but in practice this is well compensated by its extreme simplicity; the frictional loading is, in any case, small.

A more complex device suitable for following [redacted] selector, is the unit in Fig. 15. This mechanism is (or was, in pre-war times) quite well known; it [redacted] wheel **A** to rotate either way according to which electromagnet is energised and which "clutch" is engaged. The frame **B** is pivoted concentrically with wheel **A**, and centred by springs **C**. Wheel **A** is linked by any suitable means to the rudder which is either unbalanced or, if balanced, fitted with return springs to ensure that it centralises when neither electro-magnet is energised. The degree of rudder angle is not, of course, controllable and wheel **A** will continue to rotate until its toothed segment is clear of the driving gear, by which time the rudder is hard over. This device is [redacted] unpleasant design from a purely mechanical point of view—but it does work!

A better method of picking up a mechanical drive is to use an electromagnetic clutch. Fig. 16 shows [redacted] design I have used successfully. The two parts of the magnetic circuit are of soft-iron, the coil being wound on [redacted] celluloid former and set in shellac. The slip-rings [redacted] simply pressed on over [redacted] plastic impregnated band of insulation.

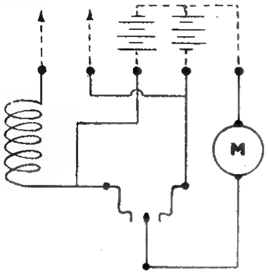


Fig. 13

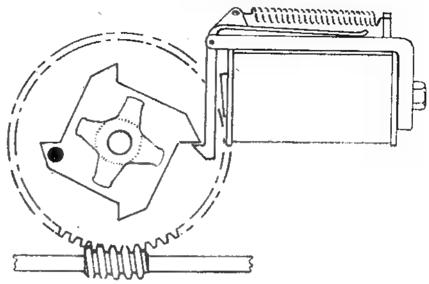


Fig. 14. *Escapement friction-drive from propeller shaft*

The wattage required to transfer [redacted] given power is remarkably small, particularly, of course, when the clutch is used on [redacted] high-speed shaft (to reduce the torque transferred).

Apart from their substitution in such systems as shown in Fig. 15, a pair of these clutches can be used in a "proportional" system or true servo unit, to operate [redacted] control with considerable power and yet sensitively.

Although I have not yet carried out any experiments, preliminary estimations indicate that a larger form of this type of clutch might even be used to transfer main power to the propeller shaft without too great [redacted] continuous current drain. This would simply solve one of the biggest problems in radio control—declutching [redacted] i.c. engine. The weight penalty would not be great, [redacted] the coil unit could act [redacted] the engine flywheel.

Another method whereby the speed of an i.c. motor may be controlled was described in my article in THE MODEL ENGINEER of February 28th, 1952, and used two contact-breakers. As [redacted] substitute for the changeover switch mentioned, I would suggest a two-way selector on the lines of the unit shown in Fig. 12; the contacts would require to be heavier, however, [redacted] personal experience has shown that endless trouble can be caused in i.c. installations by inadequate switching arrangements inserted in the ignition system. The control unit described in the previous article used [redacted] centrifugal clutch intended to stop forward movement of the model when the motor dropped to idling speed; in fact, the propeller shaft invariably rotated in this condition sufficiently to maintain way on the model, and [redacted] magnetic brake would be necessary to suppress rotation of the shaft completely. This trouble is basically due to too high an idling speed, and obviously depends upon the motor.

Had an auxiliaries' drive shaft not been available for fitting the second contact-breaker, the normal breaker would have been arranged for motor-driven control; experiments were, in fact, conducted to ascertain whether the usual (rather

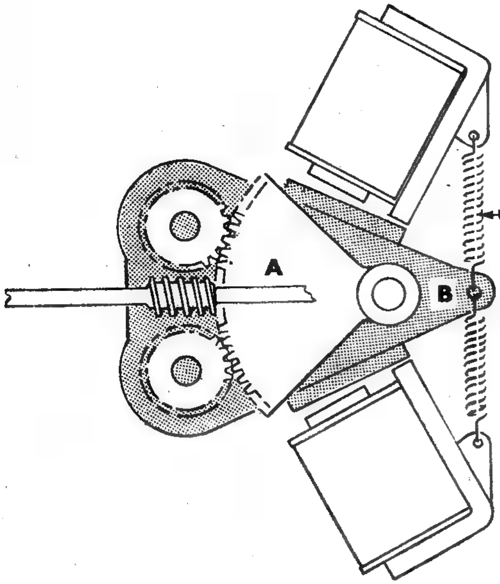


Fig. 15. Either electromagnet can attract frame " B " and thus engage one or other of the pinions with the worm

stiff) ignition control could be economically adjusted by ■ small motor. In connection with this and similar steering applications, the following figures may be of use to intending constructors. The " Frog " electric motor is perhaps typical of inexpensive commercial models, and was used in the steering unit shown in Fig. 12. A worm on the motor shaft meshes with ■ wheel (40 : 1) having ■ pinion with 6 teeth ; the latter drives a 78-tooth wheel giving an overall ratio of 520 : 1. When connected to ■ 4.5 V flash lamp battery (giving 4.1 V on load), 0.35 A is consumed under no load conditions, the speed of the motor being 10,000 r.p.m. Under the maximum practicable load, the speed drops to about half this figure, and using 0.8 A ■ force of one pound is produced at the end of the actuating lever, ¾ in. long, i.e., ¾ lb./in. ; thus loaded, the tip of the lever moves through ■■ arc 2¼ in. long in 3 sec. This power is sufficient for almost any model control application, including, for instance, the reversing lever of ■ reciprocating steam engine.

In order to carry out complete control of ■■ i.c. powered model, some form of gearbox is generally necessary, though there are two exceptions to this rule (which, it is hoped, may be described later).

Systems involving sliding dogs are hardly suitable without ■ clutch to accompany them, ■■ in car practice ; it seems probable, however, that the marine-type of gearbox shown in principle in Fig. 17 could be adapted for model use by anyone with ■ taste for complexity on ■ small scale.

Alternatively, I have experimented with the gearbox shown in Fig. 18 and can verify that this is effective without being difficult to make. Wheel **A** and cone clutch **B** are one unit, and engine driven. **C** is a layshaft and at the after end drives **D** (loose on output shaft **E**) via ■■ idler gear (to reverse the motion) **F**. The male portion of the clutch, **G**, can engage with the two female parts on either wheel **A** or **D**, or it may float between them, thus giving Ahead, Neutral and Astern.

The movement of **G** was, experimentally, produced by ■ yoke acting on ■ thrust collar **H** outside the box, but a better arrangement is obviously possible. This unit suffers from excessive friction (later minimised by the use of ball thrust-races) and some slip probably occurred between the clutch members.

It would, however, be ■ solution to a rather difficult problem, particularly so since it is easy (if rather " unmechanical ") to provide sufficient power with ■■ i.c. engine to compensate for friction losses.

Both this and the marine gearbox referred to require considerable power to operate, applied over ■ limited distance. It is desirable to utilise electric power only when changing from one position to another, so that the use of solenoids, etc., to change gear is ruled out.

(To be continued)

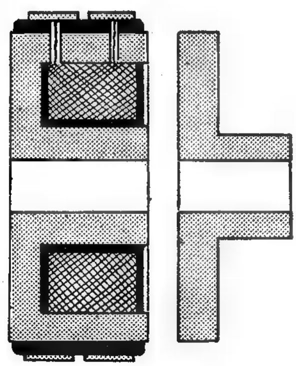


Fig. 16. The " pot " magnet cover is simply made on the lathe, being circular in transverse section. Size about 1½ in. diameter

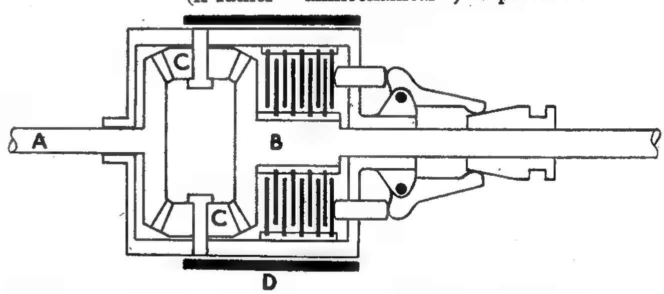


Fig. 17. When the multi-plate clutch is engaged, the whole unit rotates as one, giving Ahead. Releasing the clutch and engaging band brake " D " causes the bevel cage to be held stationary ; driving shaft " A " then rotates driven shaft "B" via bevel pinions "C," giving Astern. As shown, neither clutch nor brake is engaged, giving Neutral. Clutch and brake are operated by cams on ■ common shaft

SOME MOTOR-CAR REPAIRS

by "Duplex"

NOWADAYS, it is not always possible to get car parts and instruments repaired by the manufacturers and, instead, a complete new unit may be offered at a correspondingly high cost. However, this expense can often be saved by carrying out relatively simple repairs in the small workshop, as the following examples will perhaps show.

To make sure that the new pulley is firmly fixed in place, the bore was machined 1 thousandth of an inch less in diameter than the seating on which it fits. The bore of the finished pulley should be given a slight lead by chamfering its edge with a scraper. After the seating has been oiled, the pulley is placed in position so that it can be pressed home by squeezing the parts together in the vice. The components should be protected from damage by covering the vice jaws with soft clams or strips of cardboard. To enable the pulley to be pressed right home, a metal ring will have to be placed over the projecting end of the seating. The finished repair is illustrated in Fig. 3, and the wearing qualities of the pulley will now, no doubt, be better than in the original design.

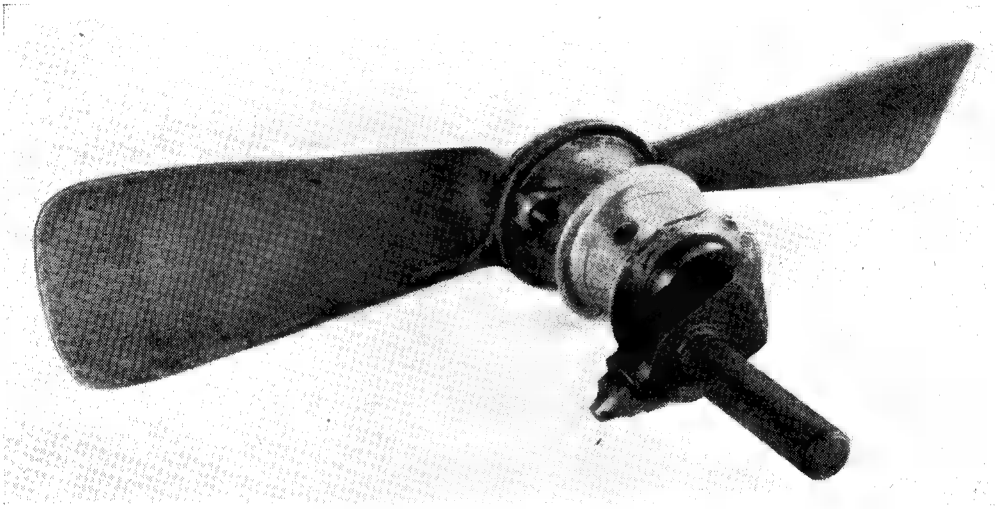


Fig. 1. The damaged fan pulley

Repairing an "Austin Seven" Fan Pulley

The small belt pulley attached to the fan itself often suffers rather severe wear, especially when made of aluminium alloy and driven by a flat belt.

As will be seen in Fig. 1, not only is the pulley under repair much worn, but one flange has actually been partly broken away.

It appears that, the crowning on the pulley having been worn down, the belt undercut the flange and finally broke it off owing to the side pressure exerted.

Rather than try to obtain a new part, it was decided to save time and expense by repairing the old pulley. After the fan had been removed, the component was mounted on a mandrel in the lathe and the broken pulley was turned down until a parallel seating was left, as illustrated in Fig. 2. Next, as also shown in Fig. 2, a new pulley ring was machined from a short length of mild-steel bar. It is important to make the pulley crowned, that is to say slightly convex on the surface where the belt runs, for this will make the belt automatically keep to the centre of the pulley and not rub against the flanges.

Two Speedometer Repairs

It was noticed that the needle of the speedometer fitted to a small car tended to stick at 30 m.p.h. and then jumped upward only after the speed had been somewhat increased. On dismantling the instrument, it was found that the small thrust-plate (Fig. 4) controlling the end-float of the main spindle, was much worn; this gave rise to increased friction in the moving parts and accounted for the erratic behaviour of the indicating needle. Clearly, the best way of taking up the wear was to make and fit a new thrust-plate.

The plate engages in a groove formed in the spindle itself, and the width of this groove was,

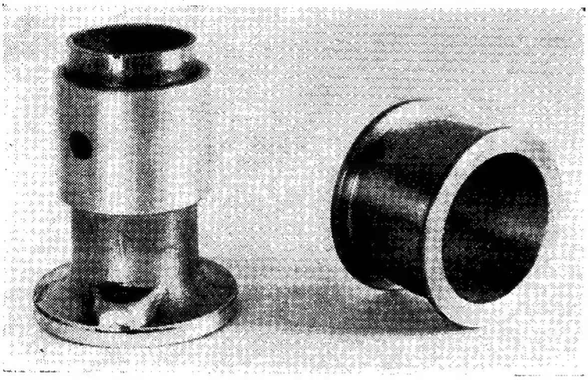


Fig. 2. The remachined hub and new pulley

therefore, measured with a feeler-gauge, as represented in Fig. 5, and was found to be 0.041 in.

The length of $\frac{1}{16}$ in. $\times$ $\frac{1}{2}$ in. mild-steel strip used for making the new part was filed and then polished with fine emery-cloth to a thickness of just less than 0.041 in. by careful checking with the micrometer. Next, the plate was lightly case-hardened on the open hearth, and the slight distortion caused by dipping in cold water was corrected, until the part was found to be flat when tested on the surface plate.

Success

After again polishing the working surface, the plate became an accurate fit in the spindle groove. The speedometer was then reassembled, and a test made under running conditions showed that the instrument worked normally and gave a steady reading at all speeds.

The second repair, undertaken for a friend, took rather longer, as previous mishandling had broken off the upper pivot of the main spindle. Rather than make a new spindle and refit the controlling hair-spring, it was decided to fit a new pivot to the broken end of the shaft. Fortunately, as shown in Fig. 6, a small portion of the original pivot remained, and this was used as a register for centring the new part.

The replacement pivot was turned from silver-steel to the dimensions given in Fig. 7 and, after a recess had been drilled to receive the broken pivot, the fitting was hardened.

The underside of the part was next tinned with solder of low melting point, and the upper end of the shaft was also treated in the same way.

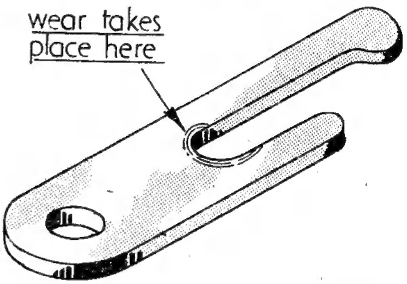


Fig. 4. The worn speedometer thrust plate

When the new pivot had been put in place, as shown in Fig. 8, the soldering-iron was again applied to sweat the two parts together, but care should be taken to avoid drawing the temper of work. For this kind of soldering, where it is

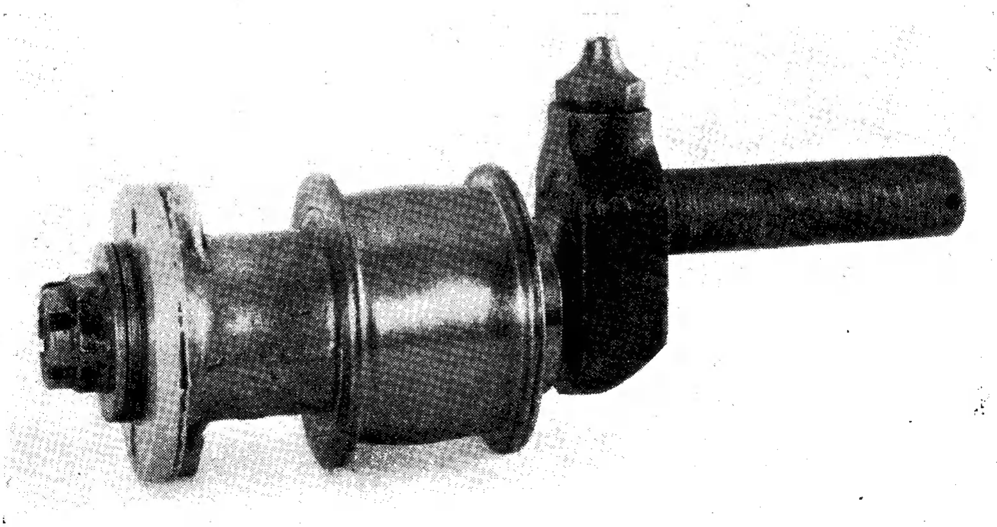


Fig. 3. The finished repair

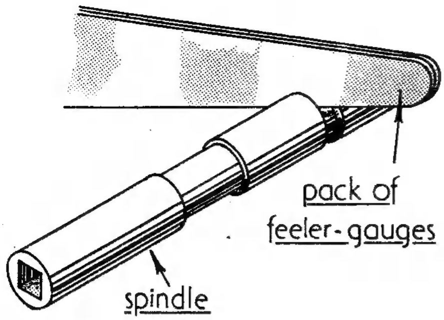


Fig. 5. Measuring the spindle groove with a feeler-gauge

important not to overheat the parts, fusible metal has been found useful as a solder in conjunction with a flux of zinc chloride or Baker's fluid; even lacquered brass name-plates can be attached in this way. After making this repair, the spindle was found to work freely in its bearings under the control of the hair-spring.

Making Brake Cable Pulleys

When their bores become worn, cable pulleys do not always turn freely, and wear or scoring of the cable groove tends to damage and fray the cable.

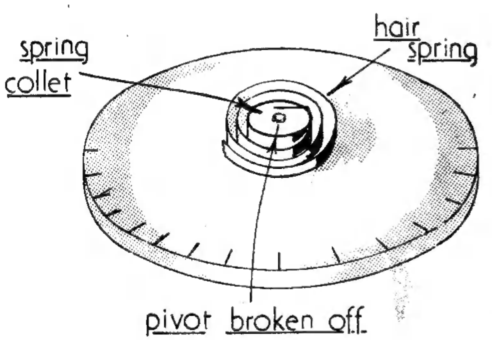


Fig. 6. Showing the broken end of the spindle

Making a single pulley or a batch of these parts is not a difficult matter, but time will be saved if the machining operations are carried out in the proper sequence.

Mild-steel will serve for this work, but pulleys made of cast-iron will last longer. The suggested sequence of machining operations is illustrated in detail in Fig. 10.

Where steel bar is used for making the pulleys, the blanks are sawn off a little longer than the finished length to allow for facing. A steel blank or an iron casting is, next, gripped in the self-centring chuck for facing and then forming the

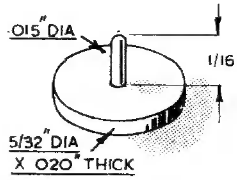


Fig. 7. The new pivot member

bore by drilling, boring, and finally reaming to size.

A stub mandrel, fitted with a clamp-nut is used to hold the work for facing the reverse side and also for turning the part to the finished diameter.

Fig. 8. Sweating the pivot in place

When machining a batch of pulleys, they should be made of uniform size by working to readings on the slide indexes.

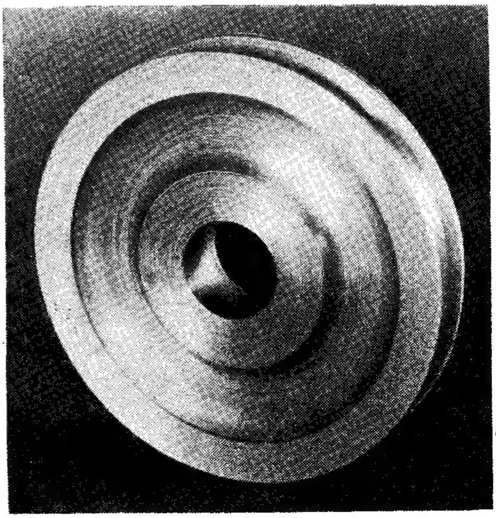


Fig. 9. The finished brake pulley

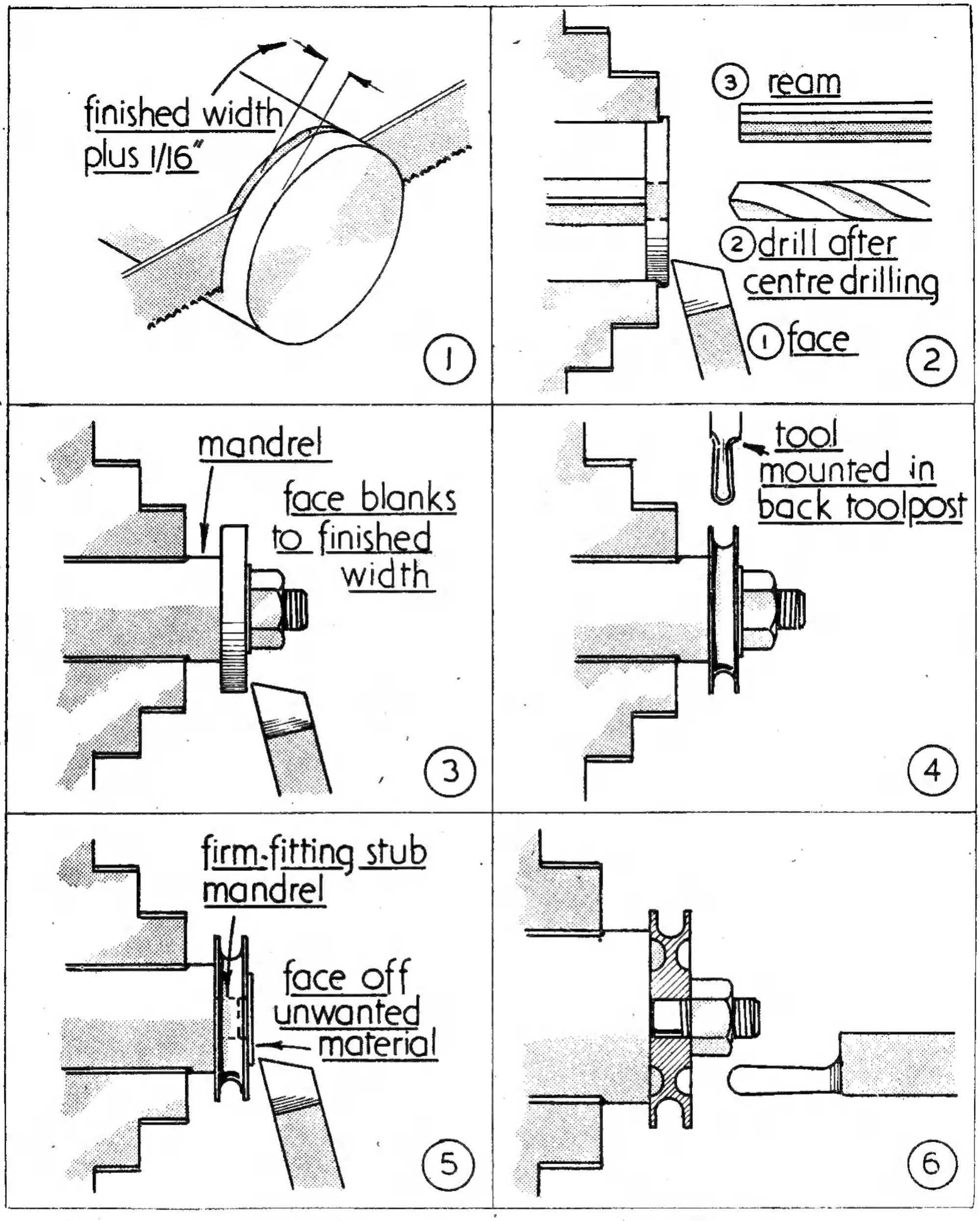


Fig. 10. Sequence of operations for machining the pulley

If the lathe is sufficiently rigid, the cable groove can be formed by taking a single, plunging cut with a tool of full width, preferably mounted upside-down in the back toolpost ; otherwise, the machining is carried out by first entering a parting tool to the full depth of the groove, and then finishing the channel with a narrow, round-nosed tool.

For removing the surplus metal up to the central bosses, and for taking the final facing cuts, the pulley is pressed on to a well-fitting stub mandrel.

The appearance of the finished pulley will be improved, and it will also be lightened, if an annular recess is turned on either face. For this purpose, the pulley is again clamped on the threaded stub mandrel, and the machining is carried out at low speed in order to avoid chatter.

PRACTICAL LETTERS

Universal Dividing Head

DEAR SIR,—I feel I must answer Mr. F. J. Haynes's letter in the July 24th issue, with reference to the dividing head by Mr. A. R. Turpin.

I have been waiting to hear of the trials of others in making this device ; I started off by following the instructions to the letter, and what an expensive job it turned out to be ! One casting and one brass dividing plate had to be scrapped, and after two bronze worm wheel blanks were scrapped (at 7s. 10d. each) I sat down with an engineer's data book and worked out the correct dimensions of a worm and worm-wheel of six turns per inch. (Very, very different dimensions from Mr. Turpin's !) After starting again with a fresh hob and blank, I was rewarded at the first attempt.

The following are a few quotes taken from the articles relating to the worm and hob :—

Width of tool tip is given as 0.050 in. ; should be 0.056 in.

Depth of thread is given as 0.070 in. ; should be 0.093 in.

Angle of thread is given as 4.5 deg. ; should be 5 deg.

If anyone following Mr. Turpin's instructions has managed to make the hob turn the worm wheel without taking a few of the teeth off, he should pat himself on the back. My two attempts were hopeless.

With regard to the dividing plate, we are told that for holes of 20 and under, two extra holes must be left on the strip. Try it, Mr. Turpin, like I did, and you will find that you have one hole to spare.

The casting was scrapped because one cannot get one plate $\frac{1}{8}$ in. thick, two fingers $\frac{1}{4}$ in. thick, one spring and one cap on to a $\frac{3}{8}$-in. spigot as dimensioned in the drawing, can you ?

These were the trials of one who followed like a lamb in his inexperience, but I learned my lesson and hope that others may benefit. From now on it is " check and recheck " ; it's cheaper !

Yours faithfully,

Huddersfield S.M.E. EDWARD HALL.

DEAR SIR,—In reply to Mr. Hall. As mentioned in my article, the worm wheel is not supposed to be of true Acme form, but only an approximation.

It is used as a measuring device, and not for the transmission of power. The main difference is that the teeth on the wheel will be narrower at the tip, and not so deep as the true Acme ; and why this should make it impossible or even more difficult to hob than the correct form, I fail to see.

Regarding the number of holes in the perforated strip, I have made a slight slip here, but if Mr. Hall had marked the strip as suggested in the article; or had even checked his own work, the error would have been apparent immediately.

Regarding the final complaint, although the fingers do measure $\frac{1}{4}$ in. each, they fit into each other so that the thickness of *both* of them is only $\frac{1}{4}$ in. The cap only has a shallow recess cut in for registration, say, 1/64 in., and the spring 1/64 in. ; this can easily be accommodated by taking a skim off the spindle bracket, and there is certainly no need to scrap anything.

Yours faithfully,

Banstead. A. R. TURPIN.

Twist Drill Grinding

DEAR SIR,—I have waited for a more able pen to reply to Mr. G. Lines's letter of June 19th *re* the above subject, but perhaps for perfectly good reasons they have refrained.

Mr. Lines may be a highly skilled craftsman who can guess every time to a thousandth of and inch, and assumes that other metal-workers who, after many years of hand-grinding drills, are " mutts " to wish to attain greater perfection than he does. I admit to being one of those ; " Duplex " and his followers I assume are others. I would recommend him to read Van Royen's article in Vol. XXIX then he will understand that something more than " trial and error " enters into the end of the drill we are told to study.

In support of my contention, a pair of calipers and a piece of chalk may do very well if one has not a micrometer and dial indicator, but only another " mutt " would despise these for the former. I appeal to these fellow homeworkers to have nothing to do with " near-enough " methods ; make all the equipment you can and put the best workmanship into it, so that you can rely on it when put to further use.

Yours faithfully,

King's Lynn. JOHN D. ELAM.

Miniature Grand Prix Racing

DEAR SIR,—When looking through a few back numbers of THE MODEL ENGINEER, I noticed an error in a diagram.

It occurs in the issue of October 18th, 1951, page 515. The drawing is of a rear guide runner, and it shows the curved flange on the wrong end, i.e. it would run *above* instead of *below* the guide bar.

I don't expect you to do much about it, because it is rather a long time ago, but I feel that you should know about it.

As far as I know, there is only a small model boatbuilders' club out here in Cape Town, so the possibilities for model engineering out here seem to be very restricted. In fact, I think that a greater circulation of THE MODEL ENGINEER in Cape Town would " buck things up a bit."

I am always sorry that I only started reading THE MODEL ENGINEER a year ago, because I am sure I missed quite a lot. I am a great admirer of " L.B.S.C." and Mr. Westbury, and I simply love reading their articles, because they are very, very far from useless.

Yours faithfully,

Cape Town, S.A. C. J. RYBNIKAR.